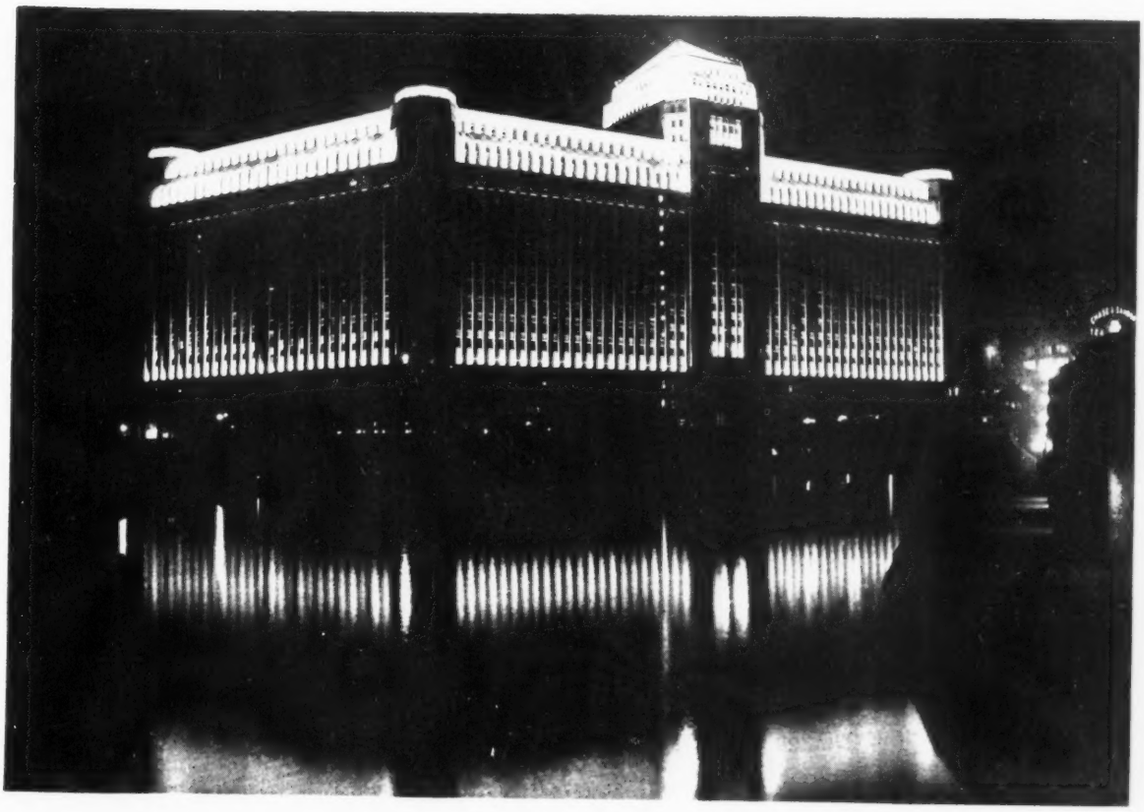
American Artisan

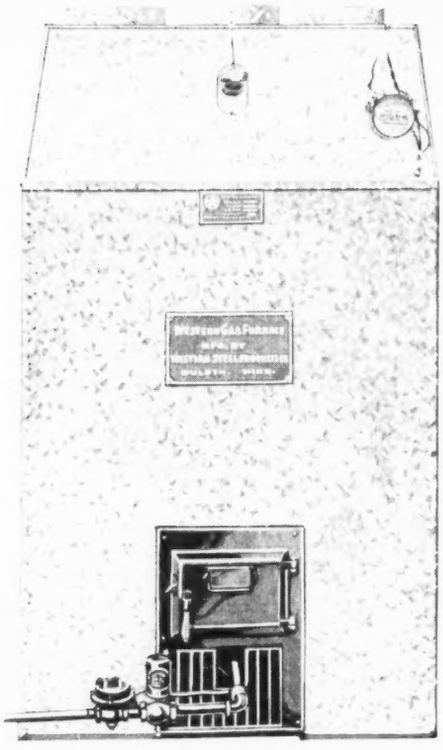
THE WARM AIR HEATING AND SHEET METAL JOURNAL

FOUNDED 1880



The Merchandise Mart, Chicago, is the world's largest building. The roof of the main tower and of the small towers are covered with copper formed to fit the unusual step-type roof design. In addition, there are thousands of feet of copper flashing and gutter lining. The story of this interesting job is in this issue

MARCH 30, 1931



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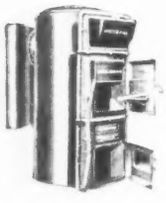

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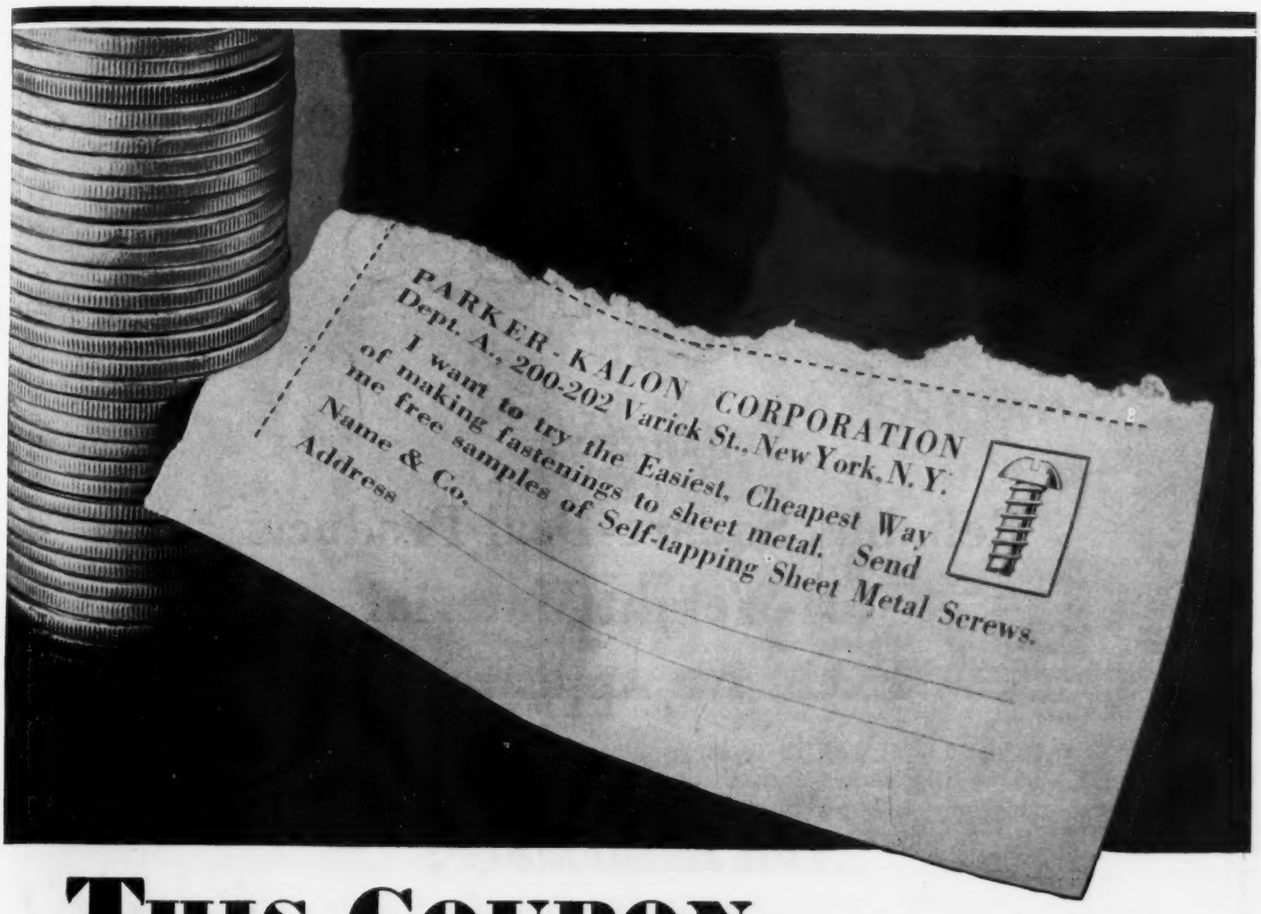
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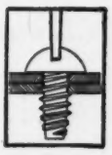

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INDEX PAGES—8 and 56 **[VOL. 100, No. 7—$2.00 PER YEAR]** **BUYERS' DIRECTORY—52 and 54**

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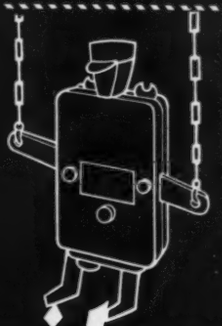

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American Artisan

THE WARM AIR HEATING AND SHEET METAL JOURNAL

Covering All Activities
IN
Gravity Warm Air Heating
Forced Warm Air Heating
Sheet Metal Contracting
Air Conditioning
Industrial Roofing
Merchandising
Ventilating

Of the many copper jobs completed last year none has been more interesting than the work completed on the Merchandise Mart, Chicago. The job is not intricate, nor is it the largest copper project, but it has some unusual angles of design and erection. This would be a good story to show to your architect friends.

* * *

Contractors not located in New England will be interested in the recirculator installation in the Cambridge, Mass., school. We usually think of recirculator school jobs as large size, expensive projects. But here is a small school having every recirculator principle incorporated.

* * *

It's not too late to take part in that fan problem argument. This issue contains the first solutions. Shortly, we will publish others which had to have drawings made to illustrate their suggested changes. Details of the problem are in this issue, so you can still study the problem and let us have your ideas.

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JOSEPH D. WILDER
Editor

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Illustration at right is 5 times actual size. Corrugations wedge hinge pin in hole.

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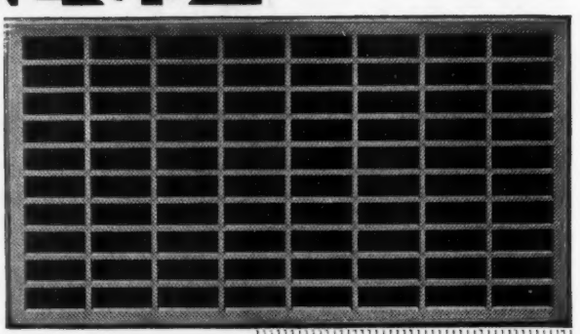

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Volume 100

American Artisan
THE WARM AIR HEATING AND SHEET METAL JOURNAL

Number 7

The Sheet Metal Tide Is Coming In

FROM time to time during the past year we have called attention on this editorial page to developments taking place in the sheet metal industry. Naturally most of these references to possible changes have had to do with what may be expected of architectural sheet metal.

But other developments of equal magnitude are ahead.

There is, for instance, the field of structural sheet metal. Most readers are familiar with the recent wide use of metal for the exterior of large buildings. Most every community, also, has examples of metal shop fronts, adornment and interior decoration.

Equally important developments are ahead in the field of metal construction. Not as trim, but as out and out structural fabrication. Within the last two years considerable publiciy has been given the metal frame house. This type of structure has progressed from one man's dream to an actual adoption in numerous communities. Its popularity is still to be determined, nevertheless the idea is sound.

And if it is sound, who is going to erect the all-metal building of the future? The structural members need not be of the shapes used today in structural steel work. For houses, lighter members, similar to the metal lumber now patented, and formed from sheet as light as 22 gauge formed and either ready cut to the house or supplied in lengths to facilitate handling will probably be a factor.

This type of building need not necessarily fall to the structural iron worker. Neither need it go to the carpenter. It should be erected by the sheet metal contractor.

But if it is, the metal contractor as we know him today will have to change mightily. He will have to become a fabricator equipped to use welding, portable metal working machinery and machines not yet on the market.

We have heard lately of such things as all-metal houses formed as room units of sheet metal. The home owner will buy a living room, one or two bath rooms and as many bedrooms as necessary. These will be delivered to the job already welded into a unit. The rooms will be put together and welded or bolted together.

Who is going to do work of this kind? The sheet metal contractor should.

And metal floors in those future metal and glass commercial buildings we hear about. Steel floor plates are now ready for marketing. They are to be put together by welding. Who will do this erection? Again the sheet metal contractor.

These developments are only forerunners of great things to come in the sheet metal field. Perhaps the sheet metal contractor of today will not survive the intense competition bound to come. Or perhaps there will arise another type of metal contractor ranking as a major contractor rather than a sub, who will be advisor and right-hand contractor of the architects and builders.

This future metal contractor will not be doing tinning and wash boiler work. Rather he will be an erector, a fabricator, a merchandiser, equal or larger than the same class of contractor of today.

Much of this has been talked around before. And much of it have been passed up with the feeling that such things are nice to talk about, but not probable as factors in this generation's life.

But men who talk so should not forget that less than ten years ago sheet metal was at the very ebb of depression. There just wasn't any. But in the last three years the tide has turned and sheet metal work done today is superior in design, larger in contract size and of wider variety than ever experienced before.

So it is not improbable that most of us will live to see these things we have cited come to pass, perhaps to become accepted modes of life, perhaps to pass by as fleeting fancy—but—they will come and the sheet metal contractor should be ready to contract such work when it is adopted.

World's Largest Building Is Permanently Protected by Copper

ON the north bank of the Chicago River, at the spot where in 1830 stood Chicago's first general store, there stands today another structure—the world's largest building—the Merchandise Mart.

This gigantic structure is over ground occupied by railroad tracks and is one of the first air rights buildings in the Middle West. Two city blocks long and one block deep, twenty-four stories high at the tower, there are approximately 4,000,000 square feet of floor space inside the walls.

Thousands of tons of materials of all kinds were used in construction. Throughout the building the very best of design and construction coupled with the best in materials and craftsmanship are everywhere in evidence.

Of interest to us is the use of copper for the roofing of six small towers and the large central tower which dominates the front wall. In the covering of these towers more than 20,000 square feet of copper roofing was used. In addition, there is more than 17,000 feet of base flashing around the roofs and also 17,000 feet of cap flashing. All this flashing is of copper. Around the 19th floor, the penthouses, and the towers there is more than 13,200

The Merchandise Mart, Chicago, holds the title of "World's Largest Building." Only the highest quality of design and materials were sanctioned. More than 20,000 square feet of copper roofing, 34,000 feet of copper flashing and 13,200 feet of copper gutter lining protect and ornament the huge structure. The design of the copper sheeting and the erection of the metal constitute an interesting story in architectural sheet metal work

square feet of copper gutter linings.

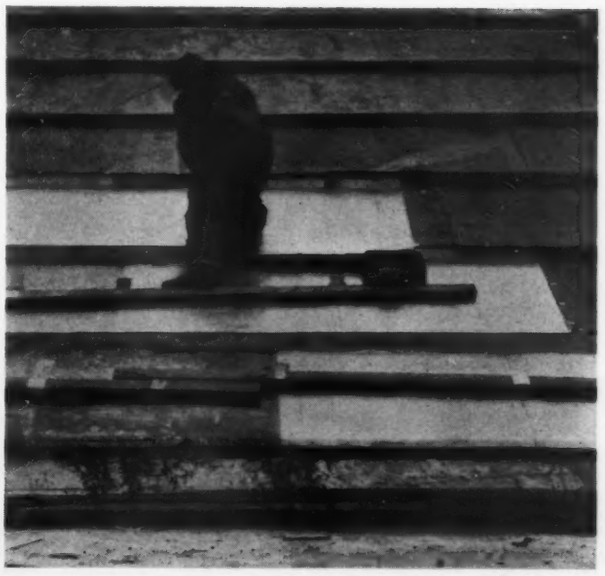
A smaller part of the contract included some 150 copper louvres set into the walls of the main penthouse which houses much of the mechanical equipment of the building and in fan rooms at the east and west ends of the building. These louvres all have stationary shutters.

The contractor who handled this large copper job is the Harry C. Knisely Company of Chicago. The contractor had a large force of skilled mechanics on the building for many weeks and in addition had forming and assembling work going through his large shop for a long period.

The handling of the material was worked out so that rapid shop production and trucking of material to the building could go forward without interruption all during the job. In the shop a straight line method of production has been perfected eliminating confusion, waste effort and lost time.

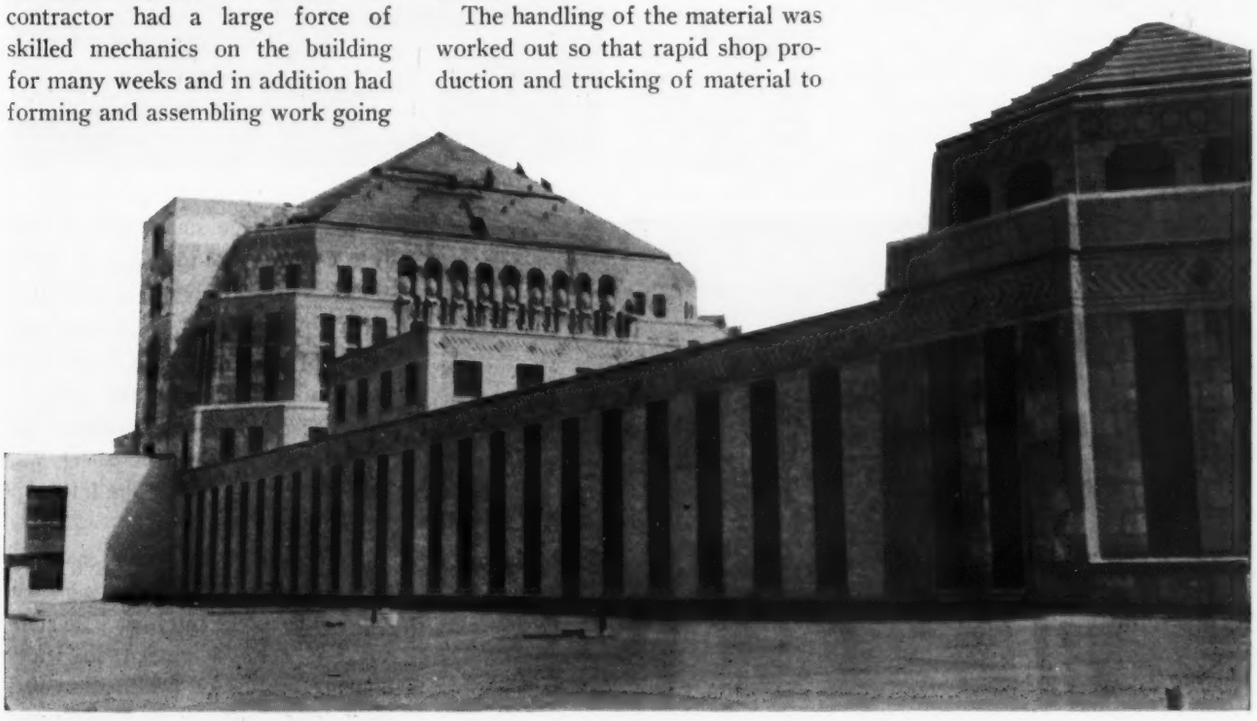
Not only is this method of production used for architectural work, but also for the fabrication of metal doors and windows which are the principle activity of this sheet metal firm.

All the towers—large one and small ones—are identical in design.



The workman has pulled a sheet into the left edge lock and is working the sheet up against the nailing strip preparatory to clipping the upper edge

The right edge and the top edge have been clipped. With the dolly held on the top sheet the workman is peening the double lock which holds the sheets between courses together



This is the tower as seen from the main roof. It is a building in itself. The main roof, the setbacks and all levels are copper flashed

As a result the contractor worked out a standardized sheet which could be used on all the towers. This was made possible by the fact that the steps of all roofs are of equal height or rather width. The only variable, then, for the contractor was to adopt a standard length. By using this standardized sheet and modifying the tapered sheets for the hips the contractor was able to put the sheets through the shop on a rapid schedule.

Before explaining the design of the copper, some details of the roof construction should be emphasized. The roofs are of a step type. The base of the roof is a concrete slab on which is placed an insulation layer. This forms the steps as the concrete slab is smooth topped.

On top of the insulating layer there is a heavy composition roof. The bottom of each step has a large four sided beveled wood nailing strip. The lower edge of the step is thicker than the upper edge. A cross section of the roof construction is shown in one of the drawings.

As put through the shop and delivered at the job, the flat area of the sheets were made 3 feet 10⅛ inches long by 2 feet 5 inches wide. Each sheet in addition has an added edge for a double lock on the left and right edges and a 1-inch edge for a double lock at the lower edge.

Above — The upper workman is nailing the first side clip after the left lock has been pulled together. The lower workman is nailing the 2 by 4 scaffold through the sheet

▼

Right — On the main tower two and three courses were carried across simultaneously. As one workman locked the lower seam the lower workman placed new sheets and clipped them

Closeup of the clips. Note the close intervals between clips. The lower lock has not been formed

The upper edge stands almost verticle for 4 inches to which is added 1 inch of metal for the double lock.

The lower edge was folded partially in the shop and when laid was double locked to the sheet in the course below and malleted flat. The right edge of the sheet was folded on top side and the left edge folded under the sheet.

As shown on the details, each row of sheets began with an end sheet tapered to fit the hip line. The steps up the roof decreased in width sharply, so that on the small towers only four sheets in each bay could be cut rectangular and all the oth-

ers had to be tapered. This did not apply, of course, to the main tower, which has a very large roof area.

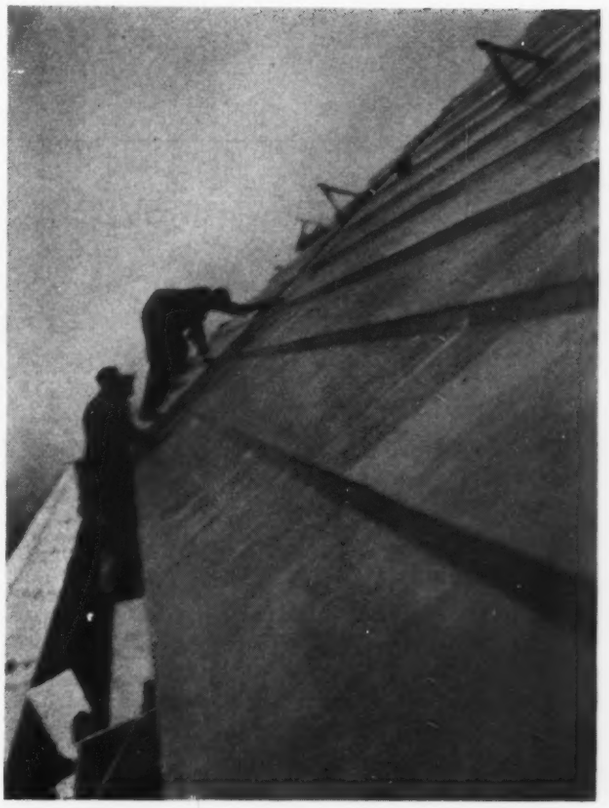
The laying operation was worked out so that work went forward rapidly. Beginning at the first course the sheets in one bay were laid on the step and the first sheet clipped first along the right edge and then along the top to the nailing strip of the second step. The next sheet to the right was then hooked into the preceding sheet and pulled tight to the right and clipped along the right edge.

The standing top edge was then worked into position against the nailing strip and the top edge clipped fast. These clips, as shown on some of the photographs, were nailed at 8-inch intervals.

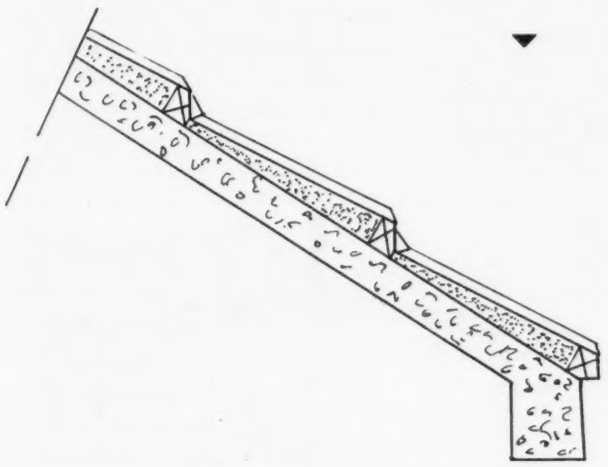
In practice, especially on the main tower, complete rows across any one bay were not always laid before the next above step was covered. Sometimes two or three steps might be carried along at the same time. In this case, when the lowest sheet was clipped into position the sheet above was pulled tight to the right in its own row and worked into correct position at the top. It was then clipped first along the right edge and then the top.

A special wood dolly was held over the lower edge of the top sheet and the lower sheet with its clip and the upper sheet were double locked. With the mallet the double lock was then pounded back against the face of the nailing strip.

In order to provide a scaffold



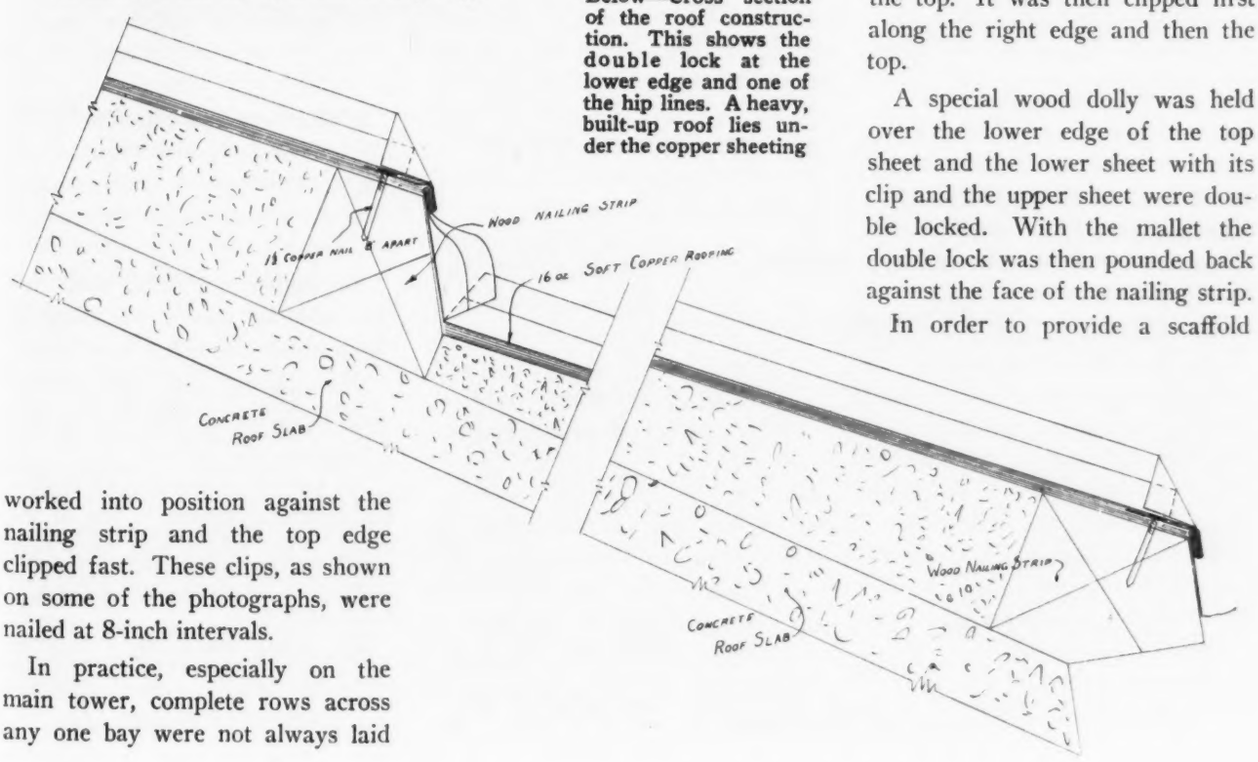
The roof has been completed and the workmen are soldering the scaffold nail holes as they work down. This also shows the large copper lined gutter of the main tower

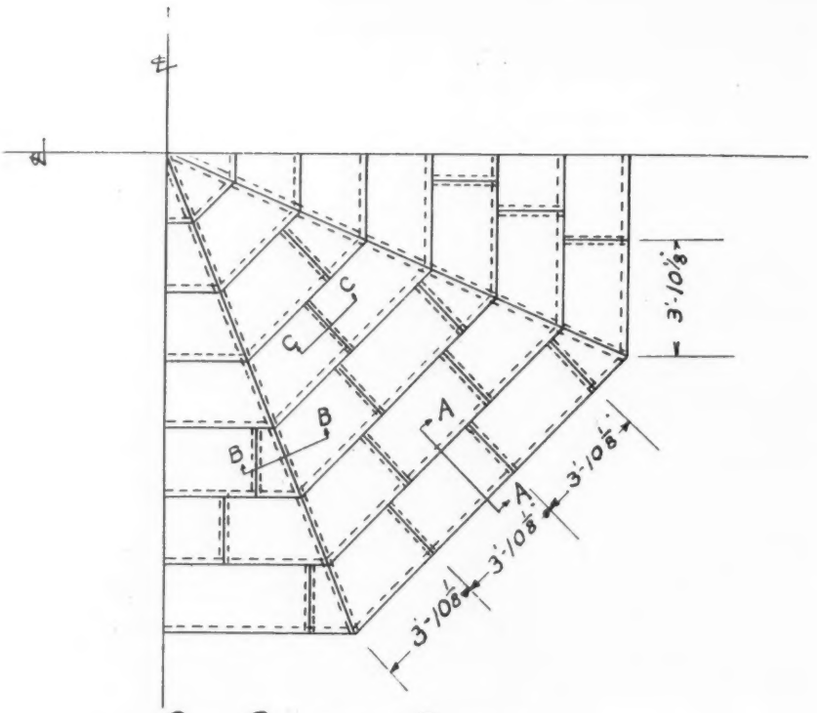


SECTION THROUGH ROOF

Cross section of the roof construction showing concrete, insulating layer and nailing strips

Below—Cross section of the roof construction. This shows the double lock at the lower edge and one of the hip lines. A heavy, built-up roof lies under the copper sheeting





ONE QUARTER PLAN OF PENTHOUSE PYLON

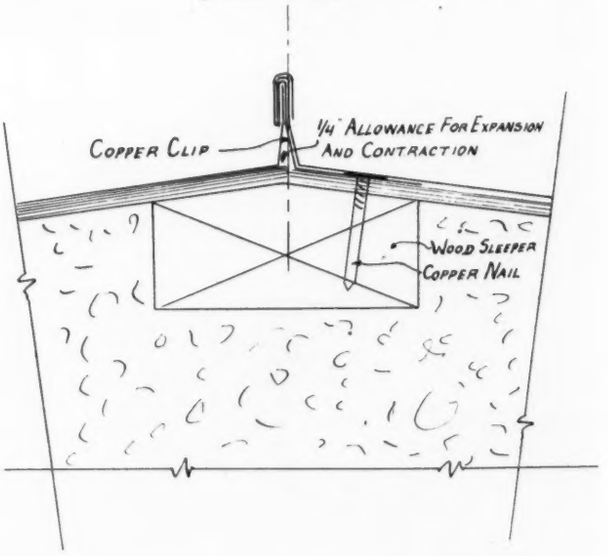
Left—Quarter plan of a typical roof. This shows the arrangement and formation of the sheets and by dotted lines indicates seams. The main tower and the small towers all used the same sheet

for the workmen, lengths of two by four's were used. These were nailed into the roof through the copper. When the top of a bay was finished the scaffold was taken down step by step and the nail holes soldered tight.

The hips of all the towers are standing seams as shown in one of the details. A special clip was used here. These clips were cut in the shop and brought to the job folded upward and over and back once.

In locking this hip the sheet to the left of the hip was laid first. This sheet ends in one standing edge. The clip was then placed over the edge of the right sheet and while the sheet was held off the roof the clip nail was driven. The right sheet was then laid out on the step and to finish off the clip and right sheet were folded left over the verticle edge of the left hip sheet and pounded tight.

Right — Section through hip line B - B. A special clip and laying method were used used to join the sheets across the hip. Expansion is provided by a ⅛-inch shy fold of the sheet



In forming the hip sheets the fold was made ⅛-inch short of true length. This ¼-inch space provides room for expansion and contraction of the metal.

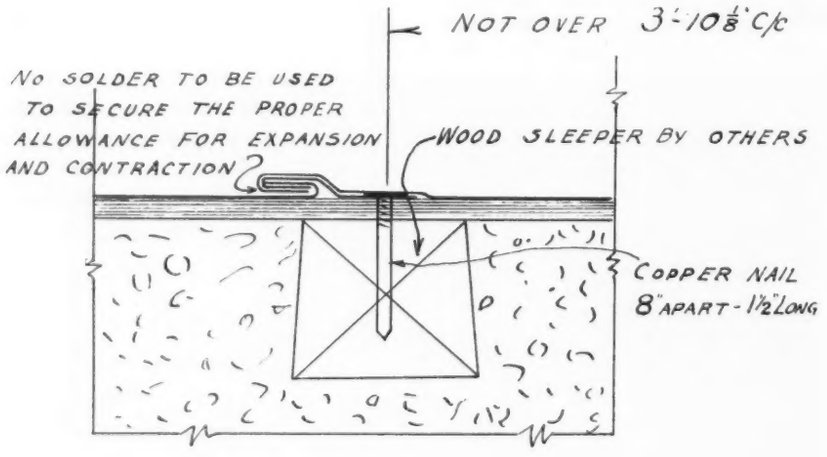
Throughout all this work the only soldering done was in filling up the scaffold nail holes.

The ends of each step standing seam hip were turned over to shut the seam.

All verticle seams are, of course, flat locked as shown in one of the details. No solder was used here either and the clips were placed on 8-inch centers.

As noted previously, there is more than 17,000 feet of flashing

(Continued on page 21)


NOT OVER 3'-10⅛" C/C
NO SOLDER TO BE USED TO SECURE THE PROPER ALLOWANCE FOR EXPANSION AND CONTRACTION
WOOD SLEEPER BY OTHERS
COPPER NAIL 8" APART - 1½" LONG

F.S. SECTION THROUGH SPLICE JOINT C-C

This shows the construction of a typical vertical joint. The double lock was turned and left unsoldered

OVERHEAD

What Is Productive and Non-productive Labor and How Can We Separate Them?

By **JOSEPH G. DINGLE**

THROUGHOUT the discussion on Cost Accounting which J. G. Dingle wrote for us last year, considerable discussion centered around this matter of figuring Overhead on either Material and Labor or on Labor alone. There never was any conclusion reached for it seems that the kind of business done determines which method works out best.

Illustrative of this interest is a letter from Davis Brothers, Roofing and Siding Contractors of Pittsburgh. Commenting on Mr. Dingle's articles and especially this matter of figuring Overhead J. E. Davis of the firm writes—

"Of the articles Mr. Dingle has written, the ones on figuring Overhead appealed to me most. We have talked to quite a few firms in our general line of business and find that of all those who do figure a set rate of Overhead, a surprisingly large number of them do not separate their payroll into Productive and Non-Productive labor.

"Unless this is done, how can one determine an accurate amount of overhead for any year? To us this is a very important matter as we know that our Non-Productive labor, plus office and estimating labor costs, all of which we show as Non-Productive labor and salaries, amounts to more than all of our other overhead combined.

"We agree with those who feel Overhead should be based upon Productive payroll and further than this we base ours upon an hourly rate for each Productive hour. Our total amount of Overhead for the year is divided by total number of Productive hours for the year and in this way an hourly rate of Overhead is determined.

"For those shops who sell a considerable amount of merchandise where Productive labor is not a factor and perhaps only a small amount of handling costs are involved, no doubt a set percentage of overhead on Productive labor would not be accurate. However, we sell no merchandise and feel that our volume of business depends almost entirely upon the number of Productive hours put in by our workmen.

"On repair jobs, especially where little material is used and labor is the main factor, we find just as much Overhead is required for the time consumed by our workmen as jobs upon which material is also a factor, with the consequent larger sales volume involved.

"Our labor rate of $2.50 per journeyman hour, on time and material jobs, does not quite cover both labor and overhead costs. However, we know this to be a fact and are not kidding ourselves. The only satisfaction derived from jobs in the MOSTLY LABOR AND LITTLE MATERIAL class is that of establishing contact with a new customer or continuing it with an old customer, with the hope that their next job will require more material, offering an opportunity to make up for the Non-Profitable job."

(Signed) J. E. DAVIS.

To this letter Mr. Dingle says:

MR. DAVIS has raised the question of separation of PRODUCTIVE and NON-PRODUCTIVE LABOR, and asks "How can one determine accurately his overhead unless labor be divided into productive and non-productive?" This is a good question and a general discussion will be quite interesting.

In cost accounting the terms "Productive Labor" and "Direct Labor" are used to mean the same thing—labor directed to production. Non-productive or indirect labor refers to labor not directly chargeable to the direct or prime cost of the job. Labor is "Non-Productive" when it is not chargeable to some specific job or customer. It includes idle time, also, in some shops, time devoted to cleaning up or repair work for the shop itself.

If all wages paid to workmen be treated as "direct" or "productive" labor, regardless of the amount actually indirect, or non-productive, the records are inaccurate in several respects. In the first place, Overhead is understated and cost of work done is overstated by the amount of the indirect or non-productive labor. You may argue that this indirect labor has been paid for and that it was wages, and should therefore be so treated. It was wages, but unsalable, therefore it must be kept separate as an overhead cost—not allowed to become a part of the cost of some job.

Another good reason for keeping indirect labor separate from direct labor is that at the close of each pay period we analyze our payroll and ascertain the portion chargeable to production and the balance which is chargeable to overhead. The knowledge of the indirect wage cost for the week is usable for the purpose of eliminating possible expenses from this source. If the indirect labor cost is high, some means

(Continued on page 21)

This is the exterior of the school. It is a remodeled house

A School Heating Plant Using a Combination Recirculator

SCHOOL heating in Massachusetts entails observance of several regulations peculiar to that state. One of these regulations relates to the use of recirculation, which is specified contingent upon several provisions not common to many parts of the country. Provision must, therefore, be made to introduce outside air whenever a warm air installation is used.

How this regulation is handled by heating contractors is illustrated in one of the school heating contracts completed not long ago by the Trask Heating Company of Boston. This firm does a volume of high class residential and school work, and much of the work going into forced air.

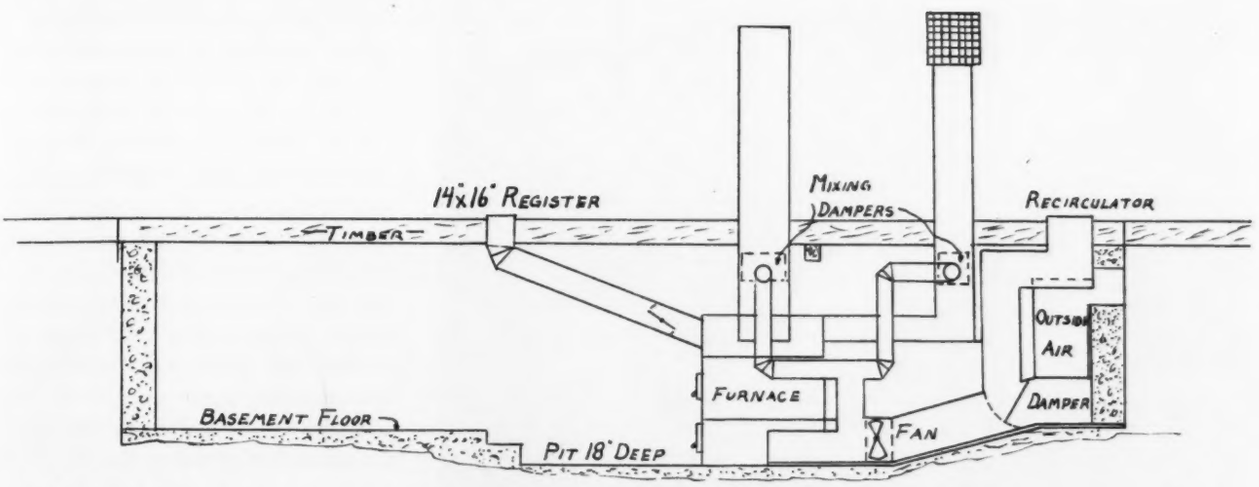
The institution is known as Lincolnsfield school and is a private academy housed in a one time residence remodeled for school purposes. As shown by the exterior, the building is a large house with a shingle exterior and a wide area of glass throughout the first floor. The floor plans show that this first floor has three principle rooms—studio, play room and work room with a small hall and a store room at the front of the house.

The installation uses a Torrid Zone furnace with a Silent Automatic oil burner to supply heat. The system is a forced air installation with a Miles propellor fan. Both the burner and the fan are automatically controlled, the burner off a first floor thermostat and the fan off a bonnet control.

The elevation of the heater shows how this matter of outside air and recirculation is handled. The outside air inlet is cut through the wall just behind the furnace. A large manual damper is placed at the bottom of the cold air boot at the base of the recirculator stacks.

When the air inside the building begins to circulate, air from the outside and air from the front of the first floor are pulled together into the fan boot. The fan is placed so that the pressure side of the fan opens into the furnace casing and also through a small verticle lead. This verticle lead is split into two branches and one branch is connected into each of the two main register risers for the two principal school rooms of the first floor.

The effect of this arrangement is that most of the air from the fan is blown through the casing where it is heated, but a smaller percentage is blown directly into the warm air risers without passing through the

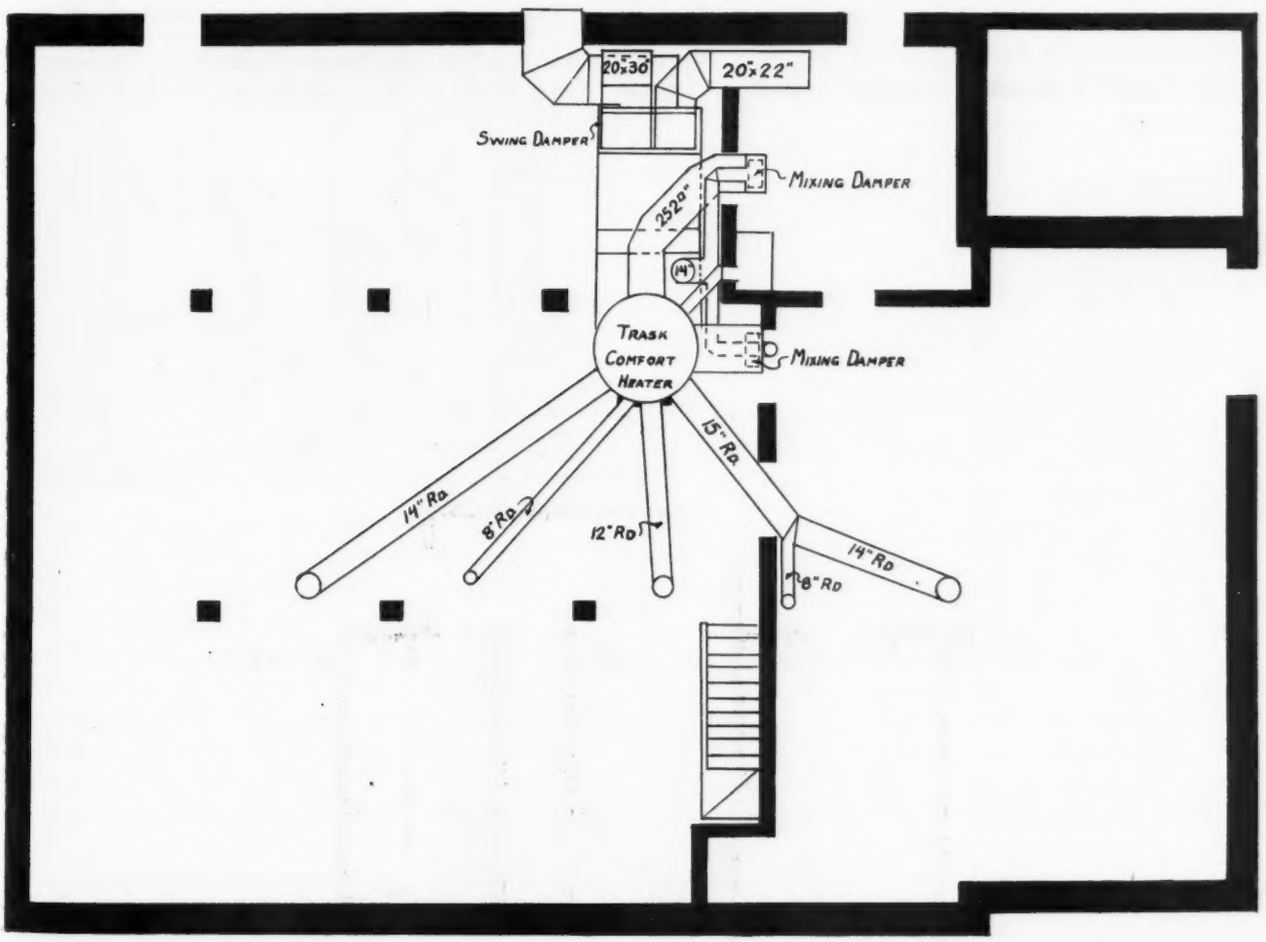


Cross-section elevation of the heating plant. Note the outside air intake and the unheated air by-pass from the fan to the risers of the two large inlet stacks. The recirculators are also shown

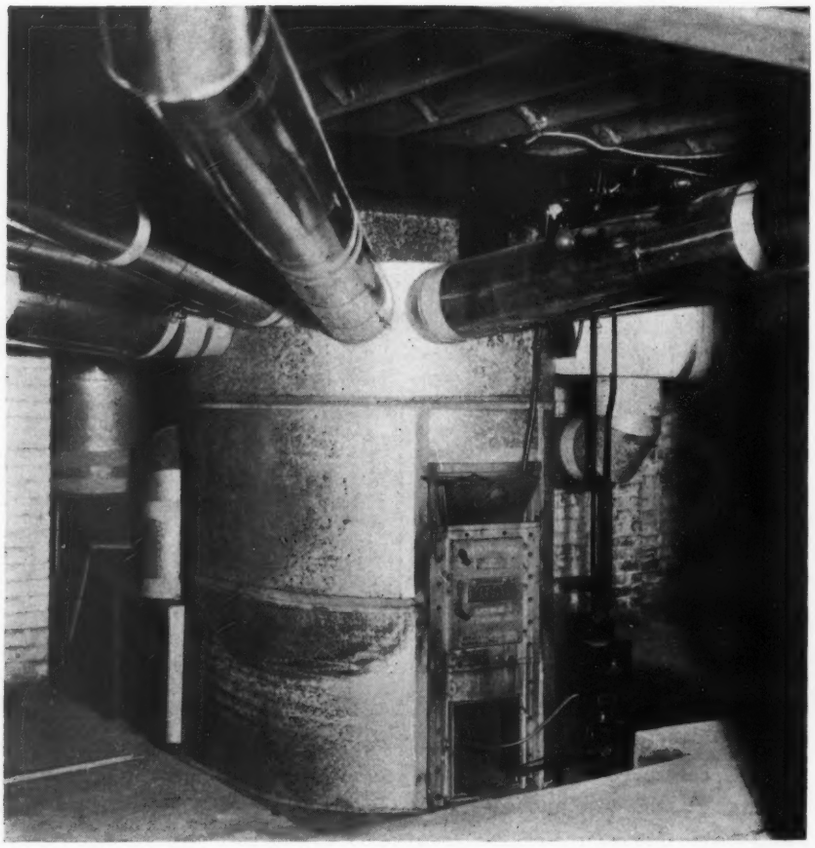
casing and without being heated.

An interesting feature of this arrangement is that this unheated air from the fan is introduced at the *outside* of the riser under the principle that this air, being unheated, is heavier than the air coming up from the casing and unless introduced at the outside will not mix thoroughly with the heated air. Being introduced at the outside, this heavier air falls into the rising stream of warm air and is then thoroughly mixed. The volume of air introduced is controlled by the size of the pipe off the fan and also by dampers placed just inside the risers.

As can be seen from the first floor plan, there are two recirculator grilles located in the floor of the play room and the studio. No other provision for recirculating the inside air is made.



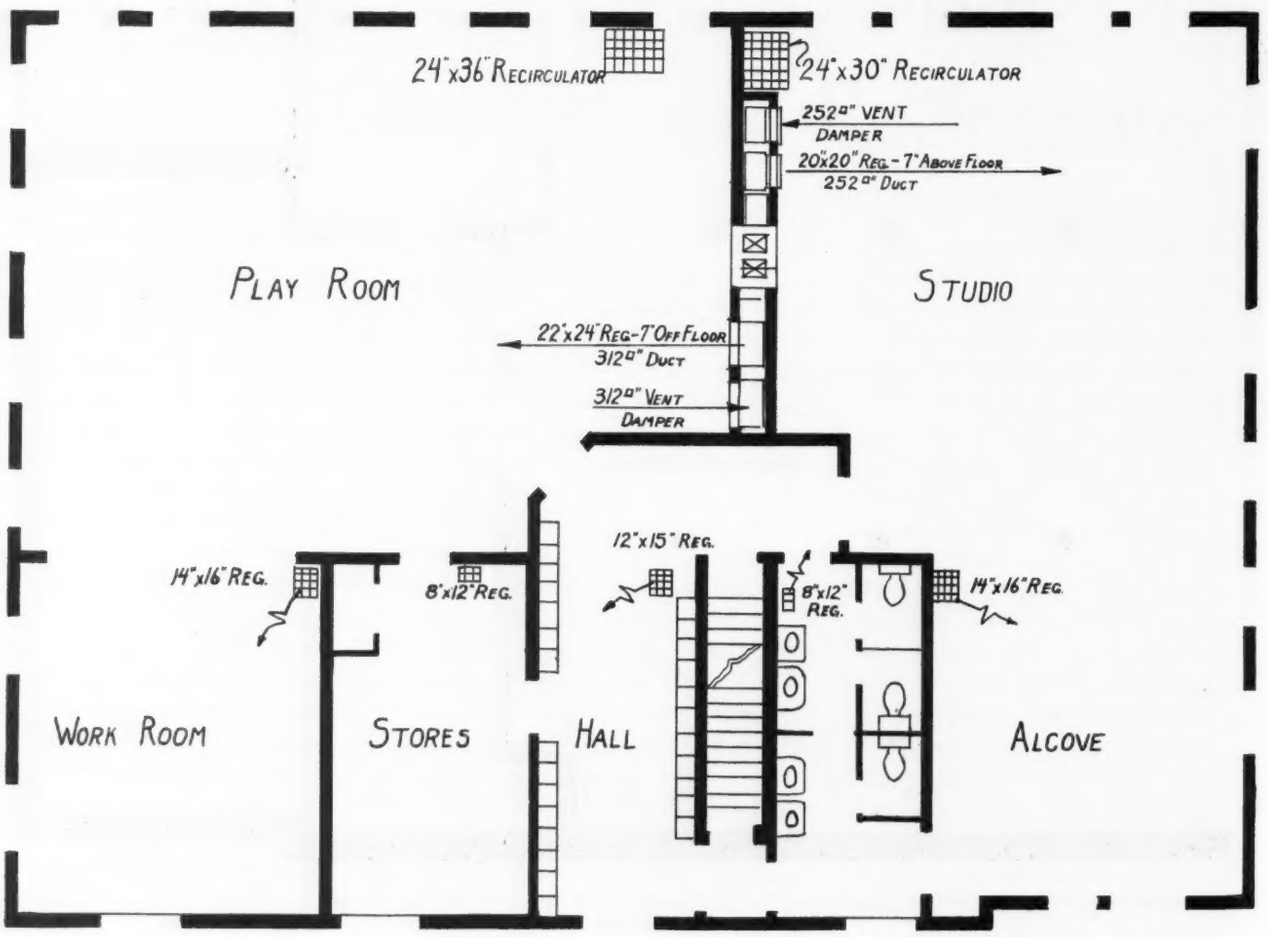
Plan view of the heating system. Excepting the two main room risers all the leaders are bright tin, round pipe. The system is compact and well balanced



The heating system installed uses bright tin, uncovered round pipes for all the leads excepting those two which have just been described. These round pipe leads are brought off the bonnet and carried at a pitch to the registers. Every round pipe has a butterfly damper for balancing the system or manual regulation should more or less heat be required in certain rooms.

The two large registers which heat the play room and studio are brought off the bonnet as rectangular ducts and pass up through the partition and exhaust through grilles located 7 feet above the floor. All the rest of the registers for the first floor are of the floor type and are located in corners out of the path of travel through the rooms. The Trask Company feels that this

Above is a picture of the furnace. Heat is supplied by the Silent Automatic burner. Below is the plan of the first floor. Note the recirculator grilles and the main inlets. The exhaust vents are alongside the inlets. All other registers are in the floor



is important in school work since traffic across school floors is heavy.

By referring to the first floor plan and the plan of the heating plant we see that the play room is heated by a duct with 253 square inches of area. Right alongside this duct there is a vent pipe of exactly the same area. The same design is used in the studio, excepting that the pipe area is 312 square inches. Theoretically, then, the same amount of air is exhausted from these rooms as is introduced so that heating depends on the furnace and fan supplying a complete change of combined inside and outside air at every air change.

The layout of the heating plant, for so large a building, is nicely compact. There are no long runs of the round pipe and the two longest ones are almost equally balanced in length. As a result of this design the system proved well balanced without the adjustment of the individual dampers.

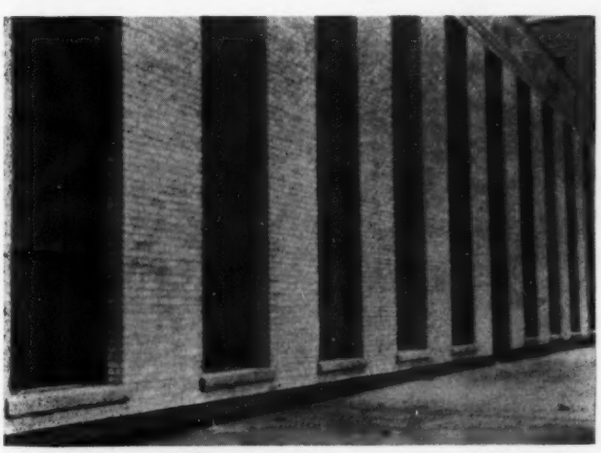
On the plan of the first floor it is evident that most of this floor is open to free air movement. With the exception of the hall and store room all the other rooms open into one another through wide doorways. This simplified the heating arrangement since free air movement might be counted on, especially through the recirculation system.

When this heating plant was being designed, the school heads wanted a method of heating which would require the minimum of attention. So an oil burner was recommended and installed as a part of the new plant. The operation of the burner is from a first floor thermostat operating at 72 degrees. Through all varieties of weather this automatic heating system has functioned without trouble, providing a uniform temperature, complete air change with warmed air circulated throughout the rooms, all without attention.

World's Largest Building

(Continued from page 16)

on the building. This is of copper and of the base and cap type. The cap flashing has a crimped lower edge for stiffening and the upper edge is caulked into the brickwork of the penthouse walls and parapets.

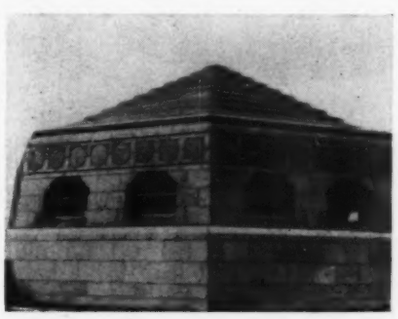


A view showing the copper flashing which was installed around the large roof areas. The flashing is two piece

Just where these thousands of feet of flashing were used can be understood by one of the illustrations which shows the large expanse of main roof and the setbacks of the towers and penthouse.

There is more than 2,000 feet of copper gutter on the building. The gutters around the main tower are the largest and are of flat box type. The stone work is flush with the outer edge of the gutter. The sheets were turned into the joint between stone work and backup and caulked tight. The seams are along the edges of the bottom.

As shown on the cover picture the tower roof is flood lighted at night and the lights are placed along the wide outer edge of the main tower gutter. Anchor bolts for the lights were cut through the copper and capped and soldered tight.



One of the small corner towers with its copper roof in place

OVERHEAD

(Continued from page 17)

should be found to convert that labor into direct labor, or eliminate it from the payroll, if possible.

Let's look at a shop where, for some reason, the records do not separate direct and indirect labor—simply allow it to appear as one item. Then, proceeding on the theory that no work can be done without a labor cost, and having but the one labor account, we must, of necessity, assume that the total of this account represents our labor cost for work done. It does represent the labor cost for work done, PLUS INDIRECT LABOR COSTS. We are, then, increasing our direct cost by whatever this indirect labor cost amounted to, and at the same time our Overhead is understated by a like amount. Prime Cost being overstated and Overhead being understated by the same amount, our profit for the year is not affected. But the figures are not usable for the purpose of figuring future business.

You may ask why these figures are not usable for future pricing of

(Continued on page 41)

Merchandising Must Be Based First On CLEAN, LIGHT, ORGANIZED SHOPS

By **JOHN J. SHERIDAN**

ALL merchandising activities must have their roots in the heating and sheet metal man's shop.

It is in the shop that work begins, passes through and ends. Regardless of what good cost records a man may keep, regardless of how busily he pursues the customer's dollar, regardless of how skilled his workmen are on the job, there can be little profit, and no routine production which spells low shop cost unless the shop be organized and equipped to insure rapid and economical handling of work.

It is one of the indictments of both our industries that we have the sloppiest places of business of any industry. Whether or not this is true, is not for me to say here. But I can say that if this is true, then something drastic should be done about it.

It might be well to consider for a minute the plumbing industry. Just a few years ago, this industry was in exactly the same situation ours is said to be in today. As a rule the plumbing shop was a mess of pipe, old fixtures, dirty floors, work benches, grease and almost every conceivable form of dirt.

A campaign to clean up the shops of the industry was started and PUSHED. The whole industry got behind the movement and within a remarkably short time the plumbing shop was just as clean

Everything has been done to make this shop efficient. Arrangement of equipment, white paint, storage for materials, have been thought of and provided for. How does your shop stack up with this one?

This is a small shop in which floor space is at a premium. Here again light and paint have been used to make better working conditions. The arrangement of this shop can be duplicated by any contractor determined to increase production

and attractive as the shops of any other line of business.

What can be done in plumbing can certainly be done in the heating and sheet metal fields. As a rule their shops and ours closely parallel one another in the kind of work done in the shop, the ease with which a shop may be turned into a clutter of tools, material and dirt.

But the plumbing industry set about righting matters and they have succeeded.

We have been hearing a lot lately about merchandising. We are beginning to look upon merchandising as the panacea for our ills. Perhaps it is. But before we get into merchandising too far, let's do a little job of cleaning up the shop. Then we can begin to merchandise.

What constitutes a good shop?

Well, one contractor probably has his answer and another contractor a different one. Of course we grant that the shop should be first of all a place to work in. And being a place to work in, it can't be so darned nice that we will be afraid to get it dirty. However, that really is carrying things too far.

I have known some contractors who were so proud of their shop that they spent half their time nagging workmen to pick up this or take out that, and their office and selling work dwindled to little or nothing.

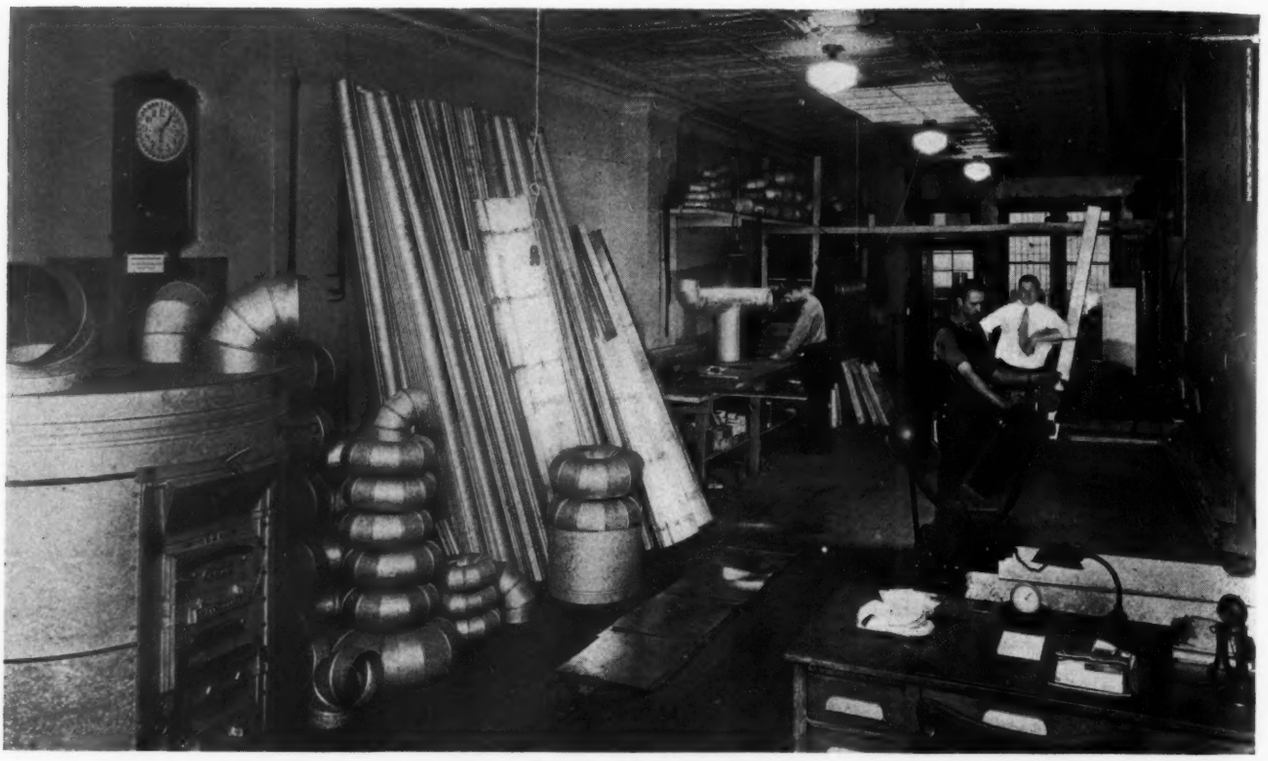
Such actions are excessive. They are also needless. What we do need is such arrangement of materials and equipment that when we look for a tool or a piece of material we know right where to go to get it.

This requires, of course, that our material bins and racks and shelves be grouped and built to handle material with the least possible amount of time and labor. Heavy material should be down low, light stuff can be up higher, out of the way. Bulky materials should be stored where they take up the least desirable space, especially floor space.

If we do heating our furnaces should be stored where they are as much out of the way as possible, but not down a cellar stairs as some shops I have been in. These same shops wondered why every time a furnace job was slated to go out the men required an hour or two to get the truck loaded.

Of course that's just plain foolish. And, of course, most of you

This shop looks cluttered, but careful inspection will show that there is a large amount of work in process. Equipment has been arranged to use all available space and light



This small, inside shop has light only at front and back. Equipment has, therefore, been arranged along both walls to permit light to come through the center and conserve space. Notice the use of paint and well arranged floor space

fellows are saying now, "Yeh, I don't do my work that way." But before you yell look around and see if there aren't some parts of your shop which could be reorganized to speed up production.

These same general recommendations apply equally well to the sheet metal contractor. His equipment may not be as heavy, unit for unit, but it, too, is bulky and unless handled scientifically, will eat up floor and wall space to a surprising degree. Racks, shelves, slides under the benches are all good places to store sheets, but if you store sheets under the benches try to fix things so that you can slide the sheets out sideways and not have to pull them out their long way. It saves time and makes better stacks of sheets.

I saw a sheet metal shop not long ago which was so dark that I honestly couldn't tell whether sheets he had on some wall racks were galvanized iron or copper. I had to ask him, and he looked at me like he thought I was crazy. It wasn't me who was crazy, but the contractor. If it was too dark to tell material, it certainly was too dark to work, yet he was trying to.

Of course, I'll grant that much can be done with artificial light, but why worry about artificial light when a couple of windows cut through the blank wall will do the same trick and nature will foot the bill. Light and plenty of it are one of the most necessary things any metal working shop can have.

If you can't get all the light you need try some white paint. It's surprising what a little paint will do. It freshens up and brightens the dingiest shop and makes everyone from the boss down to the new apprentice glad he works there.

Some old philosopher said "A chain is no stronger than its weakest link." In our industry this might be stated, "No business is any more efficient than its shop." Unless the shop is arranged to handle work efficiently, overhead will be high and jobs tied up at times when things should be rolling smoothly. Shop organization is essential to economical production

I am showing a few pictures on these pages of some good looking shops. Not all of them would take a prize for arrangement and one at least could stand some alterations toward neatness. However, what I wanted to show was that every kind of shop regardless of how it is laid out can be made efficient with a little thought and effort.

And, of course, the expenditure of a little money. Before you begin to snicker and say, "I knew there was a joker in this some place," save the breath. Of course, any alterations cost money. They would not be worth altering if they didn't cost something.

Look these shops over and compare yours with these. Some of you fellows will undoubtedly have better ones. Some of you, I know, can't say as much. Study these pictures and see how these men handle their materials, their equipment and their floor space.

Forced Air SIMPLIFIED

By FRED. R. BISHOP*

NOT many years ago warm air heating plants were "guessed in" rather than engineered, more for the reason that very little definite information was available on which to base calculations than for any other reason. Then came quite a general rule of figuring one inch of piping for every 25 cubic feet of contents in a room with one exposure and one inch for every 20 cubic feet for a room having two exposures, and just a little stronger for additional exposures. About eight years ago came the Standard Code, which has been adopted by dealers throughout the country and has become quite generally understood from every angle. It has been acknowledged to be the proper standard for gravity installations. There is no question of its accuracy because it is based on B.t.u.'s in simplified form and has been proved out through tests and research at the University of Illinois at the instigation of the National Warm Air Heating Association.

Now comes to the fore forced air systems, which have made it possible to satisfactorily heat large residences and other buildings formerly outside the scope of gravity warm air heating, with advantages even for the buildings previously within the range, such as quicker response, greater economy, less basement space, and summer cooling, together with air washing and greater humidity the year around.

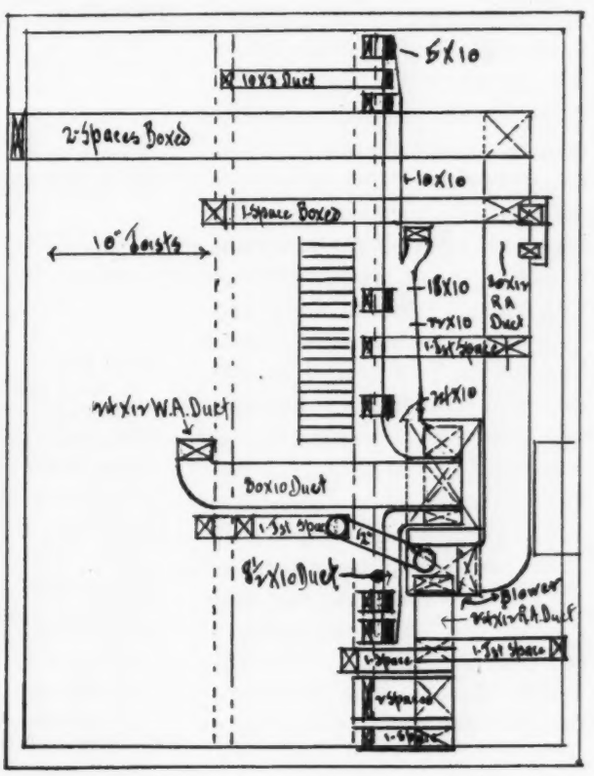
The question before the dealers as a whole is "How are we to figure these forced air jobs? We know how to figure Standard Code jobs, but when you start talking B.t.u.'s, c.f.m.'s, static pressures, velocities, and all those things, we are not quite up to you yet. Haven't you a more simple method for us to start on until we get caught up and get a chance to study these other things?"

Surely, the dealer in general is right. This new development has come so fast, and the public demanding it, that the dealer has only gotten cleared for action, let alone prepared to design and install these up-to-date plants.

Strictly speaking, in order to design forced air plants, and have them properly balance from a standpoint of equal distribution, equal friction and so on, and hold down the cost and make more basement room, it is necessary to get into the technicalities before mentioned; but in the meantime, rather than be out of the picture until this "college" education has been secured through extra study and application, more simple methods can be used in designing a forced air plant, and equal distribution secured through the use of dampers.

The most important thing to keep in mind in designing a forced air system is that in such a system, when the blower is running, the air is circulated by pressure created by the blower. This being the case, the volume of air that enters a room depends on the area of the opening into the room and the velocity back of it.

This being the case, it is neces-



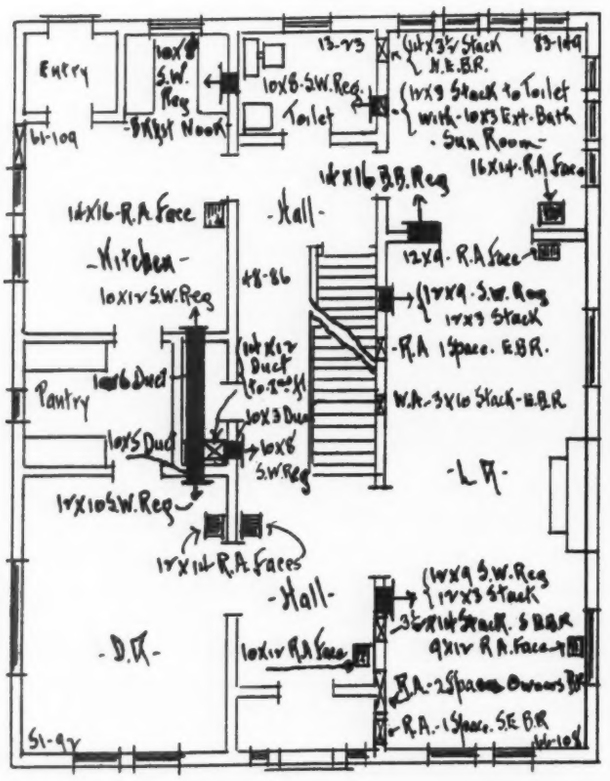
This is the layout of the heating system. The trunk line referred to in the text is shown. Both the furnace size and the fan capacity were arrived at by modified Standard Code formula. The system is sized to average five air changes per hour

Fred R. Bishop, the Brundage Company, talk delivered at Convention Michigan Sheet Metal Contractors March 4, 1931.

sary to have the duct sizes in the same proportion on all floors. It is not possible to have full basement sizes enter a first floor room and at the same time have smaller runs and duct sizes for the upper floors, as in gravity jobs, because if you do, it will be warmer downstairs than up, based on value of air entering the rooms. If one tries to get the same pipe sizes upstairs as the Standard Code calls for downstairs, it will be found impossible to get large enough stacks in the average walls, and besides, with pressure back of the blower, it is unnecessary to have as large sized pipes as with gravity circulation.

Let's see what we can do with the Standard Code on the residence job according to the accompanying plan. Take the northeast bedroom. According to the Code, this being a second floor room, and adding 10 per cent for exposure, this room would require 51 square inches of basement pipe and 36 square inches of stack area.

Forgetting the Code for a minute, the heat loss from this room is 8415 B.t.u.'s. Figuring a temperature rise of 70 degrees, meaning that the air will return to the furnace at 65 degrees and enter the room at 135 degrees at zero weather, it will require 110 cubic feet of air per minute to heat it to 70 degrees. At a velocity of 400 feet per minute, the size of the duct would be 40 square inches for a round pipe, or close to 50 square inches for a rectangular duct. Getting back to the Code, if we use a multiplier of 5 we have 42 inches required.



One of the features of the system is the use of all side wall registers excepting in the sun room. In sizing the pipes the factor 5 was used for both the first and second floor rather than straight Standard Code formula

Here is an outline of all rooms showing comparison of requirements for Standard Code, 400 feet velocity, and multiplier of 5: (Refer to Table I, below.)

From the above, you will see that if the job is figured on Standard Code basis, using a multiplier of 5 for all rooms on all floors, and not cutting down any for wall stacks, we have practically the same answer as by using the B.t.u. method against 400 feet velocity. Using a multiplier of 5, we are able to carry full size to upper floors in ordinary walls. If we use 6, the stacks would be too large for the wall spaces.

To arrive at basement mains, add totals of branch runs, making up each branch back to furnace. Let me suggest, however, on account of there being more friction in smaller pipes than in larger, the main trunk lines may be cut down in size from 10 to 20 per cent in area as against the totals of the branches and in this way make more headroom, reduce cost of trunk lines, and reduce basement heat loss.

Bear in mind, in order to make a blower job function properly and

TABLE I

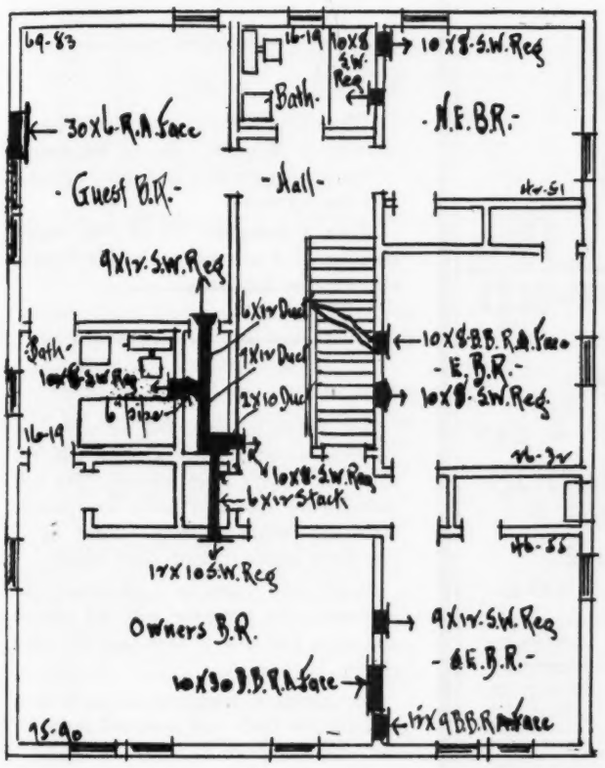
	Standard Code Regular	Standard Code Multiplier of 5	400 Feet Velocity
First floor			
Living room	108	66	62
Dining room	92	51	48
Kitchen and pantry	109	61	57
Breakfast nook	35	20	19
Toilet	23	13	13
Hall	86	48	45
Sun room	149	83	77
Second floor			
Owner's bedroom	90	75	70
Guest room	83	69	65
Bath, side	19	16	15
Bath, rear	19	16	15
Northeast bedroom	51	42	40
East bedroom	32	26	25
Southeast bedroom	55	46	43

efficiently, it is necessary to baffle the casing to a smaller cross-section than this, it should be baffled in such a way that the same distance prevails throughout between the baffle and the heating surface, and the space between the casing and baffle should be closed at the top or bottom so that the air will all have to pass between the baffle and the furnace.

Further, dampers should be placed in all runs to individual rooms, both warm air and return air, in order to adjust all runs for equal friction.

Referring to the plans herewith, let me call attention to a few points of design. All registers are located on side walls overhead excepting the one in the sun room. This is a regular baseboard, because it is not possible to get full pipe size in the side wall and there is no other space available to divide into two runs, as you will note by referring to the basement piping plan.

Note also, in order to save basement headroom, one trunk line was made for dining room, kitchen, hall, owner's bedroom, guest room and side bathroom and upper hall. This is run up two closets out of the way, and each run to above rooms enters overhead. With this layout, the only piping on the west side of the house below the joists is this one run, leaving the west basement available for recreation room or any other purpose.



Two interesting stacks to the second floor are those concealed in closets. They are out of the way and can be made amply large. Register temperatures are set at 135 degrees or a 70 degree temperature rise

The capacity of the blower is arrived at in this simplification by dividing the cubic contents by 12, which gives five air changes per hour—particularly good for summer cooling. Cubic contents are 20,384. Divided by 12 gives 1690. Divided by four equals 1359. Many times in certain constructions four air changes are sufficient to supply the proper heat; but this is a variable, and until such time as the dealer gets to a point where he can figure these jobs on a c.f.m. basis, he is safer using a 12-minute air change. In this particular job, figuring strictly according to most approved methods, the c.f.m. requirements are 1638. So you see why five air changes are recommended.

Another easy method of arriving at c.f.m. is to multiply inches of pipe (multiplier of 5) by 2.6. In this case, 632 times 2.6 equal 1643.

Use a high class blower; one that is efficient, quiet, and made by a reputable builder.

The next thing to arrive at is the furnace capacity. This job on a Standard Code basis requires 951 inches of piping. On a multiplier of 5 it takes 632. 632 is two-thirds of 951. After arriving at total inches, multiply it by 3/2 and you have furnace capacity as officially rated in catalogs. In a blower job there is no question of an increased efficiency over a gravity job. The amount of increase is not one on which there is a uniformity of opinion. It is at least 25 per cent, but in my experience I know of 50 per cent increases. If you assume 25 per cent increase you can deduct 25 per cent from 951 and you will have 703, which would be the size furnace to use on a Standard Code rating.

When I speak of four or five air changes in a house I do not mean that this same air change prevails throughout each room. The living room will get three changes, the east bedroom will get four, and the sun room will get ten air changes. The air change, you will agree, depends on the size pipe as against the cubic contents of the room. The size pipe depends on the heat loss and is therefore independent of the size of the room. It averages five changes in this entire house.

In closing let me suggest that you take advantage of every opportunity of learning more technicalities of the forced air field. Learn to figure by the B.t.u. method. From this you will arrive at c.f.m., and after you get that far you will arrive at pipe sizes through friction tables, and before long you will wonder why you did not grasp all these phases of the situation long ago. Such is life in this ever-changing world of science.

TIE UP WITH CLEAN UP WEEK

Practical Suggestions for Progressive Dealers

By **MAT. H. FRIEDMAN**

THIS good old country of ours is getting so that every week is "do something" week. We have "National Can Goods Week," "Visiting Friends Week," "Say It With Flowers Week," "Safety First Week" and "What Have You Week?"

Not to forget "Clean Up Week."

Without endeavoring to steal anyone's thunder, many of these weeks give a live, wide-awake business man an opportunity to cash in and build up certain services he has to offer. To the warm air heating dealer "Clean Up Week," which is set this year for April 20 to 25, lends itself readily to a merchandising tie-up.

It gives a dealer an opportunity to put over a service of cleaning at a time when the public should be thinking cleaning.

To better illustrate what is meant by tie-up to any particular event or activity, we have illustrated an ideal ad for the newspaper for companies using newspaper advertising. In addition to this, we have illustrated a mailing card for those using direct by mail, and last, but not least, the window card for everyone.

Let us take up the newspaper ad. We have illustrated here an ad which can easily be worked out, and which will certainly attract the attention of prospects.

You will note that we have incorporated in this ad art work; however, should you desire to eliminate this cost, we are certain that your local newspaper will gladly present a layout similar to the one we show here, and which will, no doubt, be as effective. We suggest for reader in this ad, as indicated by A and B in the illustration, the following reader material (See ad Fig. 1 and Fig. 2):

Fig. 1 Typical newspaper layout for tie-up with Clean-Up Week

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A

"Clean Up Week" is here, and house cleaning is in order. Go to the source of much of your dirt and dust. Maybe it is the furnace.

Make a complete job of this year's cleaning. Let us take care of the furnace cleaning and repairing.

B

Just 'phone us now, and we will send an experienced furnace cleaner and repairer to inspect your furnace. He will estimate the cost and make an appointment for future cleaning. That is, if you don't desire it done right away.

Should new parts or replacements be necessary, our inspector will tell you so and show you how to save fuel and have cleaner heating.

Our cleaning equipment is up-to-date, and gives a spick and span and noiseless job. Better 'phone us today.

If you desire to use a "Clean Up Week" cleaning ad, and you have a special machine for cleaning, it would be well to insert the name in the advertisement you use. It would also be well to insert the name of the furnace which you distribute. This can easily be done by placing it at the bottom of the ad under your name and address, using a full space type.

Now, for the "Clean Up Week" cards. This ad is printed on a plain U. S. postal card, and if you desire you can use a colored ink. We have illustrated here a card which will attract attention and create interest. For reader in the card we have illustrated, as indicated by A, we suggest material similar (See

Fig. 2. Suggestions for mailing card to be printed on government postal card

Fig. 2.)

We know that cleaning is a dirty job, and a hateful one, too, but let us help you make it a complete one.

Often much dirt and dust is created by the furnace. Have our inspector call at your home and inspect your furnace, making arrangements to clean it immediately or at some future date. Just 'phone ..... and our inspector will call immediately. He will tell you, also, if your furnace needs any replacements or parts, and he will make a definite appointment for cleaning.

Our new ..... cleaning system and machinery is up-to-date and will do a spick and span job for you.

Let's make Clean Up Week a real week.

Of course, it does not pay to just print these cards and then leave them in the package as returned by the printer. Have your mailing list ready, so that you can address these cards and get them in the mail as soon as they are received. Don't forget that they should by all means go to people whom you sold furnaces last year and the year before and many years before that.

Now, to think of the window. We have illustrated a card for window display which will attract attention.

The one we have illustrated is plain, but is effective in the respect that it calls attention to Clean Up Week, furnace and cleaning, and last, but not least, invites the passer-by into the store to obtain additional information.

The window card which we have illustrated should be on fairly heavy cardboard so that it will not warp or bend after staying in the window for a day or two. It should be displayed during the entire week, and kept in a very prominent position. The card should be no smaller than 18 by 24, and as much larger as you desire.

The progressive business man is always on the lookout for ways and means of increasing his business and in tying up with activities. This suggestion for tie-up on "Clean Up Week" is of a general nature and can be applied to the work of practically every Warm Air Heating dealer.

Fig. 3. Suggested window card—a job for the show card writer

A Peculiar Offset Elbow

For Ivan Speers, Detroit

By W. R. HAINES
Contributing Editor

THE following problem in heavy sheet metal was submitted by Mr. Ivan Speers of Detroit, Michigan. The problem, as submitted, states that a pipe curves from the base to the south for a distance of 5 ft. 1 in. and to the west at the same time a distance of 2 ft. 11 9/16 in. In all the pipe has a height of 6 ft. 1⅜ in. The opening at the top is on a 30 degree angle and the pipe dia. is 3 ft. 4 in.

This problem is not extremely difficult providing one understands the principles of revolution but is long and rather tedious as it involves four revolutions before the true views of all its parts can be found. Only one point is shown on each view of the opening of the top elbow simply to make the problem less confusing. Only the view of the opening of the top elbow was shown in the elevation, as a view of the rest of the pipe is not necessary and would lead to confusion.

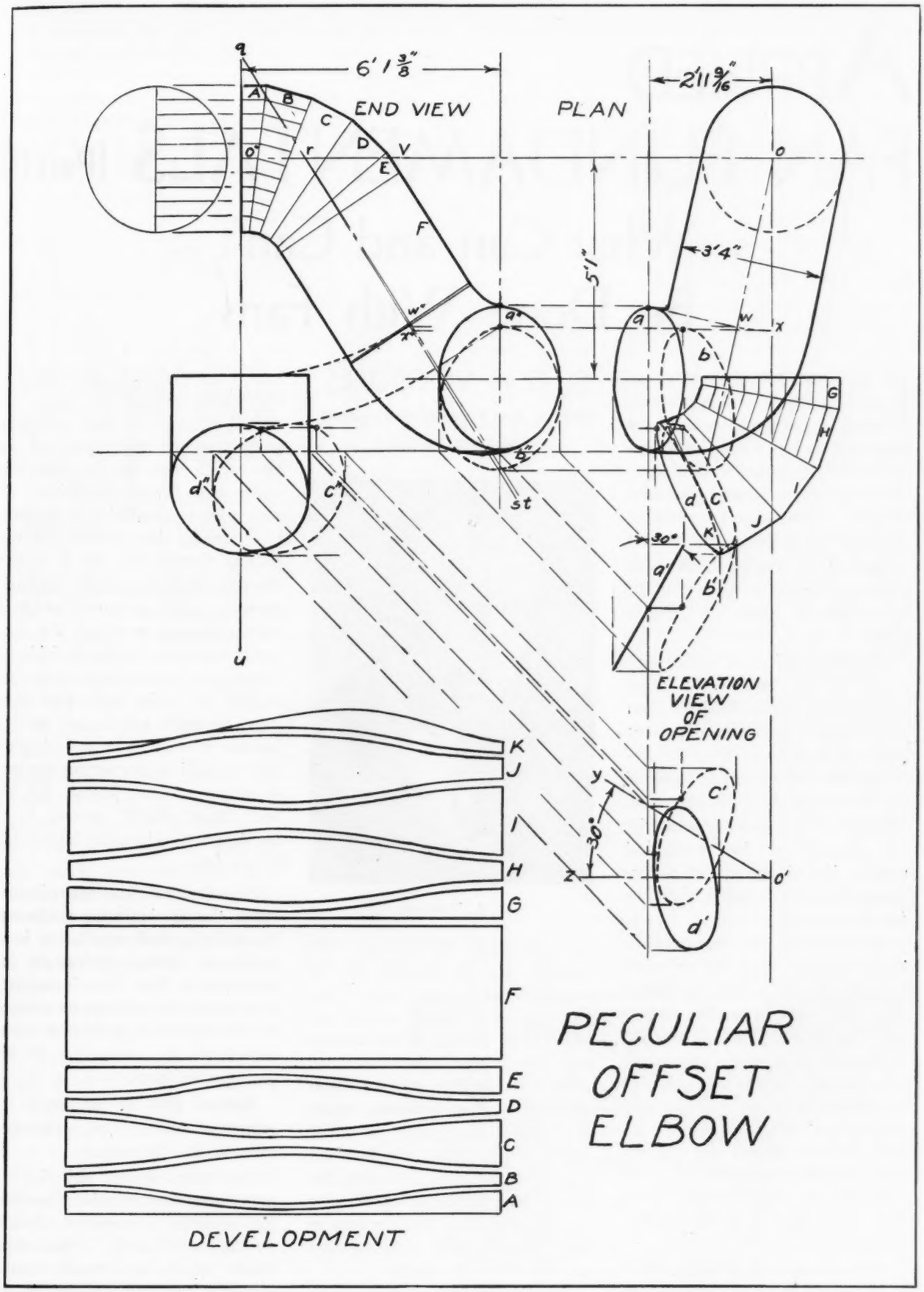
The problem gives the position of the openings and the sizes of the pipes but does not give the center-line of the two elbows facing each other. Of course this was practically impossible but the centerline is necessary in the solution of the problem.

The center-line was assumed as o-w in the plan and r-t in the end view. The three views of the opening in the top elbow are a, a′ and a″ which were found by ordinary drafting board methods. The major axes of the elliptical view of the openings a and a″ is 3 ft. 4 in. and the minor axes was found by projection from a′. The length of this line also being 3 ft. 4 in.

It is necessary to rotate the pipe, so that its center-line o-w will coincide with the line o-x, about a line passing perpendicular to the plan view through point 0 or about o″-v in the end view, to find the true end view of the lower elbow whose sections are A, B, C, D and E and the straight length of pipe F. The rotation is made by moving one point at a time from a to b till the view of b is completed. Thus, assume a point on the opening a, as shown by the dot, and project this on to the line o-w by a perpendicular line to the line o-w. Then revolve this intersection with o-w on to the line o-x about o as a center. Then take the perpendicular distance from the point to the line o-w and lay this distance out perpendicular to the line o-x from the point x. This is the original point revolved to its new position on the opening b. The same point on the end view of the opening a″ will move on a line parallel to the base line q-u as the pipe rotates around o″-v as a center. The exact position of this point on the opening b″ may be found by projection from the point already located on b in the plan view. Now revolve other assumed points on a and a″ to b and b″ by the above procedure till the view of the openings b and b″ have been formed. The center-line of the pipe in the end view will also move from r-t to r-s as the pipe moves to its new position. To find the position of r-s, a point on o-w is projected on to the center-line r-t. Then draw a line through this point on r-t parallel with the base q-u and then projecting the new point, in its revolved position on o-x, on to this line parallel with q-u. This point lies on the new center line r-s and a line can be drawn from r to this point thus locating the new center-line r-s. This completes one rotation and the true end view of the elbow whose sections are A, B, C, D and E and the straight length of pipe F can now be drawn. That is, using the center-line r-s as a center-line for the section of pipe F. The sections A, B, C, D and E can now be developed as shown on the development but the length of the section of pipe F is not known at present.

The next procedure is to find the true view of the top elbow whose opening in the revolved position is b″. This requires two rotations. The elbow is first rotated into the base line q-u and then rotated 30 degrees about a line perpendicular to o′ in the elevation view. The method of rotating the elbow, whose opening is now b″, into the base line is the same as was used in the previous rotation. The center-line r-s is extended to the base line q-u. The elliptical view of the opening b″ is revolved around this point of intersection q. That is, points on b″ are projected perpendicular down on to the line r-s and these intersections are rotated down into q-u about point q. The perpendicular distance of each point on b″ to r-s is then laid off perpendicular to q-u from the point on q-u where the projection of the point on r-s rotated into q-u intersects the line q-u. Thus the opening c″ will be formed after rotating a sufficient number of points. Each point in the plan view will move out from the opening b on a line parallel with the center-line of the pipe or parallel with the line o-x extended. The position of each point on the line can be found by the projection of the corresponding point in the end view on to this line. One side of the opening in this particular problem coincides with another view and is shown by a solid line. The elevation view of the opening c′ can be laid out by projections from the other two views c″ and c. This completes the first of the two rotations.

The opening c′ in the elevation view is now rotated down 30 degrees or in other words the elbow is turned down 30 degrees. The same method of rotation is again



used. That is, the projection of points lying on c' on to o'-y are rotated down on to o'-z, and their distances laid off, thus forming the elevation view of the opening d'.

(Continued on page 34)

APPLIED FAN FUNDAMENTALS [Part II]

What Can and Can't Be Done With Fans

By G. A. VOORHEES
Heating and Ventilating Engineer, Indianapolis, Ind.

G. A. Voorhees

IN the eighth and ninth article of the series on Fan Fundamentals which ran last year, two articles discussed various sources of noise in fan installations. In addition to those sources discussed there are, however, other sources which I shall take up in this article.

The other articles dealt with noise originating in movement set up in the air inside the heating system.

The third source of noise mentioned is the mechanical noise coming from by-pass dampers when such dampers are used to prevent backward flow of air from the discharge side to the intake side of the fan while it is in operation. Whether these dampers operate by air pressure or by mechanical means, there is sometimes a tendency for them to rattle when the fan is running.

To overcome this they may be lightly padded with felt or other soft material at points of contact *and care should be used in making the installation.* Flimsy, slipshod workmanship is often responsible for the noise. If the manufacturer of such a fan (or any other type of furnace fan) gives definite instructions for installation, his instructions should be carefully followed; otherwise the responsibility for results is wholly up to the heating contractor.

Motor noises are principally due to magnetic hum, end play in the motor shaft and in the case of ball bearing motors, sometimes a clicking sound from the bearings. The magnetic leakage depends on the windings and other structural features of the motor which are beyond the control of the heating contractor. In some induction motors, the built-in switch controlling the starting windings, makes considerable noise when the motor starts and stops but this lasts for only a few seconds. The best that the furnace man can do for his own protection is to see that the fans he uses are equipped with standard brands of known quality.

Another precaution is to avoid the use of ventilating fans as *pressure* type furnace fans. These fans have been designed and built for free delivery and the motor is wound to provide just sufficient power to move the volume of air for which the fan is designed, under *free delivery* conditions. If such a fan is installed as a pressure type furnace fan so that the air passing through the fan is forced through the piping system, the back pressure (static pressure) which it must overcome, overloads the motor and serious trouble is liable to follow. As booster fans, these ventilating fan units will often give years of highly satisfactory service because in such cases it is impossible to build up any serious amount of static pressure; instead, the air will "short circuit" around from the discharge side to the intake side of the fan.

It is significant that manufacturers of electric ventilating equipment in cataloging their ventilating fans, specifically caution against the installation of these fans in connection with piping systems on account of the frictional resistance occasioned by the movement of air through the ducts.

Beware also of universal, or other brush-type motors, on account of radio interference.

One very serious objection to unnecessary motor noise when the fan propeller is mounted directly on the motor shaft, is that these motor sounds are readily transmitted out through the shaft to the metal blades which often tend to amplify the sounds to an annoying

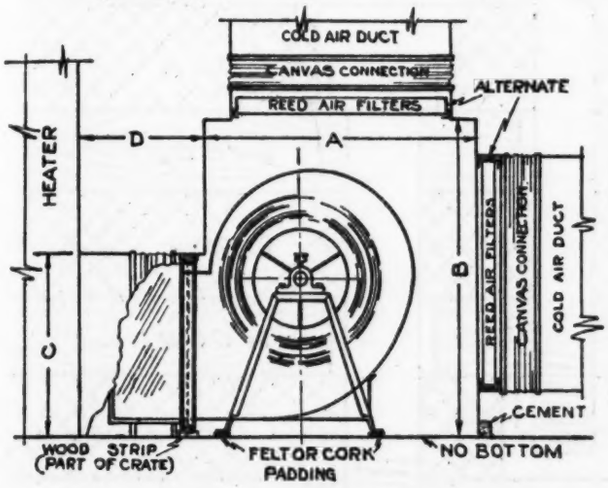
extent. The lighter the gage of metal of which the blade is constructed and the flatter the shape of the blade, the more pronounced the tendency seems to be for the propeller to magnify motor noises and transmit them to the air stream.

In the case of belt-driven fans of either the centrifugal or propeller type, the fan bearing may become a source of noise if a ball bearing mounting is used. This sometimes happens with even high-grade bearings and is quite frequently encountered with cheap bearings.

Good practice calls for an inspection of every fan before it is installed. Connect it up and run it for a few minutes to see that all parts are in good working order. Freight and express shipments sometimes get rather rough treatment and a furnace fan that leaves the factory in perfect condition may not be in such good shape when it reaches the job. If there is any defect, it's much more satisfactory for all concerned—and decidedly more economical—to know it before the installation is made.

In the case of a belt drive fan, unless the belt is of the endless type, there is liable to be a pronounced click each time the joint passes over the motor pulley. With endless leather belts, the splice sometimes is so much stiffer than the rest of the belt that the same noise is produced. This can be partly overcome by using a larger motor pulley and increasing the fan pulley size at the same time so as to maintain the same fan speed. Rubber composition and fabric belts of the endless type are free from this source of trouble.

The heating contractor owes it to his customer and to his own welfare to watchfully avoid the foregoing sound troubles by preventing the sounds as far as possible. All sound, however, cannot be prevented and the next consideration is the muffling or absorption of the unavoidable noise before it reaches the occupied portions of the building.

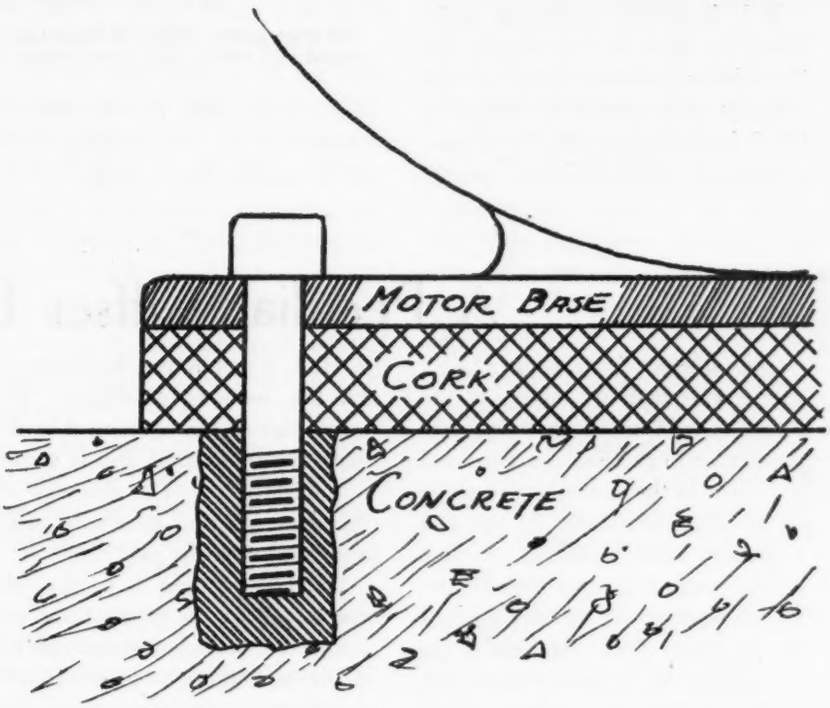


Here is one manufacturer's recommended installation of canvas connections to prevent transmission of sound through metal ducts.

In addition to the air-wave transmission of sound, there is the structural wave which travels through solid substances such as the metallic ducts and the floors and walls of the building. When we consider that sound travels in steel fifteen times as fast is in air, we see the need of isolating the source of the sound most carefully from the metal of the furnace casing and the air ducts. This is usually accomplished partly by the use of canvas connections between the fan or fan frame and the metal duct work.

Fig. 1 shows how one fan manufacturer recommends the use of canvas connections between the fan housing and the sheet metal cold air ducts. A similar connection is shown (but not labeled on the drawing) between the fan and the furnace. Such flexible connections break the path of the transmitted sound waves and materially reduce objectionable noise. They are, of course, unnecessary in many industrial installations where the sound of the fan is of no consequence.

In anchoring fans and motors, many installers overcome a part of the sound transmission that strikes downward and communicates itself



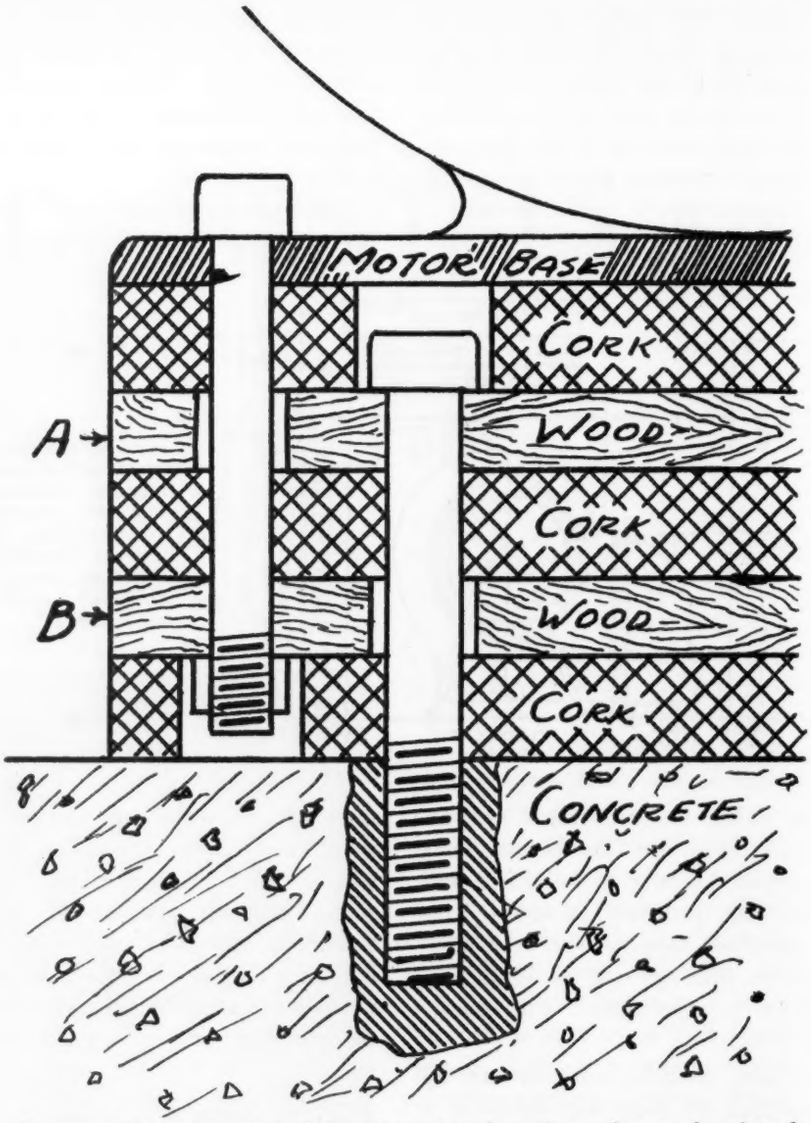
One satisfactory method of preventing motor noise transmission is to anchor the motor through a sheet of machinery cork.

to the structure of the building through the concrete floor, by placing a sheet of cork machinery isolation or similar substance between the motor and the floor as shown in Fig. 2. With such a method of mounting, the only direct path for vibration is from the motor frame through the expansion bolt or other device used for anchoring to the floor. The mounting can be made even more effective in isolating and preventing transmission of vibration by adopting the method indicated in Fig. 3.

Notice that with this latter method, vibration can be directly transmitted only from the motor base to the wood block "B" which is entirely separated by a sheet of cork from block "A" which is lagged to the basement floor.

Heavy gage metal may be substituted for the wood blocks and rubber, felt or even board form fiber insulation may be substituted for the cork. The principal advantage of a proper grade and type of cork is that it does not set or harden as do many of the other materials. It is reasonably impervious to moisture and its cost is moderate.

It is important in buying corkboard for such use, to specify the "machinery isolation type" as the common cork structural insulation which is used to prevent heat transmission is not sufficiently strong.



An even better anchor is to fasten the motor through two layers of cork and wood and anchor this base in turn through a second set of bolts to the floor.

The correct type to use can be obtained from such firms as Armstrong Cork & Insulation Co., Lancaster, Pa., and The Korfund Co., 235 E. 42nd St., New York City.

A Peculiar Offset Elbow

(Continued from page 31)

The corresponding points in the plan view will move on a line perpendicular to the line o-x extended and those in the end view will move on lines perpendicular to the line q-u. The exact positions of these points can then be determined from the projections of the corresponding points on d′ and the view of the opening d″ and d thus determined. The true view of the elbow whose opening is d and whose sections are G, H, I, J and K can be drawn in and the sections developed. The lower edge of the opening d in the plan view is invisible and is shown by a dashed line. The end view of the elbow can now be drawn in by projection from its plan view.

The last rotation is to find the true length of the pipe whose section is F. Rotate the intersection of the back side of the elbow with q-u, about q, on to the center-line r-s. Through this point on r-s draw a perpendicular line through r-s. This line is the other edge of the pipe whose section is F and the development can now be made.

No attempt has been made to show the detailed method used in the development of the two elbows as this is a separate problem. The development, of course, is for thin metal and those working in heavy metal will have to make the usual allowances which practice has taught them.

FURNACE LOCATION AND CHIMNEY DRAFT

By **FURNACE SALESMAN**

THE human body, it has been said, is likened to a furnace and it is indeed a heating apparatus of the most delicate and intricate kind.

The mouth and nose may be called the draft door and chimney of the human furnace, and should the nose become clogged and the throat filled with matter, the fire of the body is suffocated for want of oxygen, in time the furnace ceases to work and the body dies.

As the ability of the human furnace to breathe properly is necessary, just so is the ability of the warm air furnace to breathe properly a necessity, if the full measure of work and activity of either are to be maintained.

The question of a proper chimney is so important that it should be the first thing to be examined. A poor draft is a source of continual expense and trouble to all concerned.

A sluggish draft retards the flow of gas by friction and loss of heat. Soot accumulates which reduces the effective area of the flue.

Unconsumed coal in the ash pile, while often the result of the average person not properly firing the furnace, is sometimes due to a poor draft, and the furnaceman should do nothing, in connection with his installation, that would retard but rather aim to help provide a good draft for the furnace.

As air enters into a chimney flue it is heated and expanded by the hot gases and products of combustion, it rises in the flue, ascending with a spiral motion.

With the boiler-plate, brick-lined type of furnace the radiator on the back is usually partitioned off so that the smoke travel, after leaving the drum, is down practically the full length of the radiator, then up the same distance, before it enters the smoke pipe.

Smoke pipes should never be pitched down unless it is absolutely necessary, but when this is done we are told that the drop should be compensated for by a rise equal to at least twice the depth of the drop.

To improve the draft and reduce friction smoke pipes should pitch up to the chimney 1 inch per foot.

With a "down and up" smoke travel in the furnace it would appear that the smoke pipe connection to chimney should be given as much pitch upward as is possible.

If this type furnace is set with the door on an angle of 45, 60 or 90 degrees from the chimney it would appear that, what with the down and up travel in the radiator in the beginning, the chimney draft might be affected.

Particularly since angles or elbows must also be used in the smoke pipe connection to the chimney.

It seems that by setting a furnace of this type other than directly facing the chimney it would act similar to a horizontal elbow in the smoke pipe.

The reduction of draft to each 90 deg. horizontal elbow is equal to 35 or 40 feet of smoke pipe, a 45 deg. horizontal elbow about 20 feet.

As the shorter a smoke pipe the better, and horizontal elbows in smoke pipes should be avoided, for the same reason it would appear that this type of furnace should not be turned any more than is absolutely necessary. If possible it is better to locate the furnace so that the smoke outlet is on a direct line with the chimney.

The mechanic on the job must do as his employer dictates with regard to locating the furnace. The firm that employs him is usually anxious for a proper installation and are responsible for the functioning of the entire heating system to the chimney.

Their judgment and experience must be respected and if they say that the turning of their furnace away from the chimney in any direction does not interfere with the draft, the mechanic on the job is then relieved of that responsibility.

The advantage in so locating the furnace is that the home-owner doesn't have to carry his coal so far, from coal bin to furnace, and oftentimes the cold air ducts can be more easily connected to the furnace.

I would like very much to hear from other readers of the AMERICAN ARTISAN with regard to their experience or instructions to their salesmen or mechanics with regard to the placing of their furnaces.

As a manufacturer or dealer of the boiler-plate, brick-lined type of furnaces have you found any difference which way the furnace faces from the chimney?

Remember That Fan Problem?

HERE'S THE FIRST SOLUTIONS!

REPRODUCED on this page is the layout for a forced air system which doesn't work. Details of the problem were published in the February 16 issue.

Here are the main points:

The duct sizes were determined by the cubic feet for each one and the velocity of the air, which was figured from 300 to 500 feet per minute.

The cold air returns, of which there are 2, come together and are introduced to the fan chamber through one duct.

The fan that was originally figured for this job was a propellor type having a rating of 1,600 c.f.m. As the house only requires 92,100 cubic feet per hour, this size was thought to be ample, but during the first three weeks of operation we found that this fan was not working as it should, so we examined the plant to see if there was anything blocking the air flow, but as we could not find any obstruction we tried redesigning the various fittings, but still no better results. So we came to the conclusion that a larger fan was necessary so we installed a larger sized propellor fan but still we couldn't get the air toward the front of the house.

Now as the house calls for approximately 1600 c.f.m. and the new fan has a rating of 3000 c.f.m. we thought our troubles were over, but the plant still does not operate as it should.

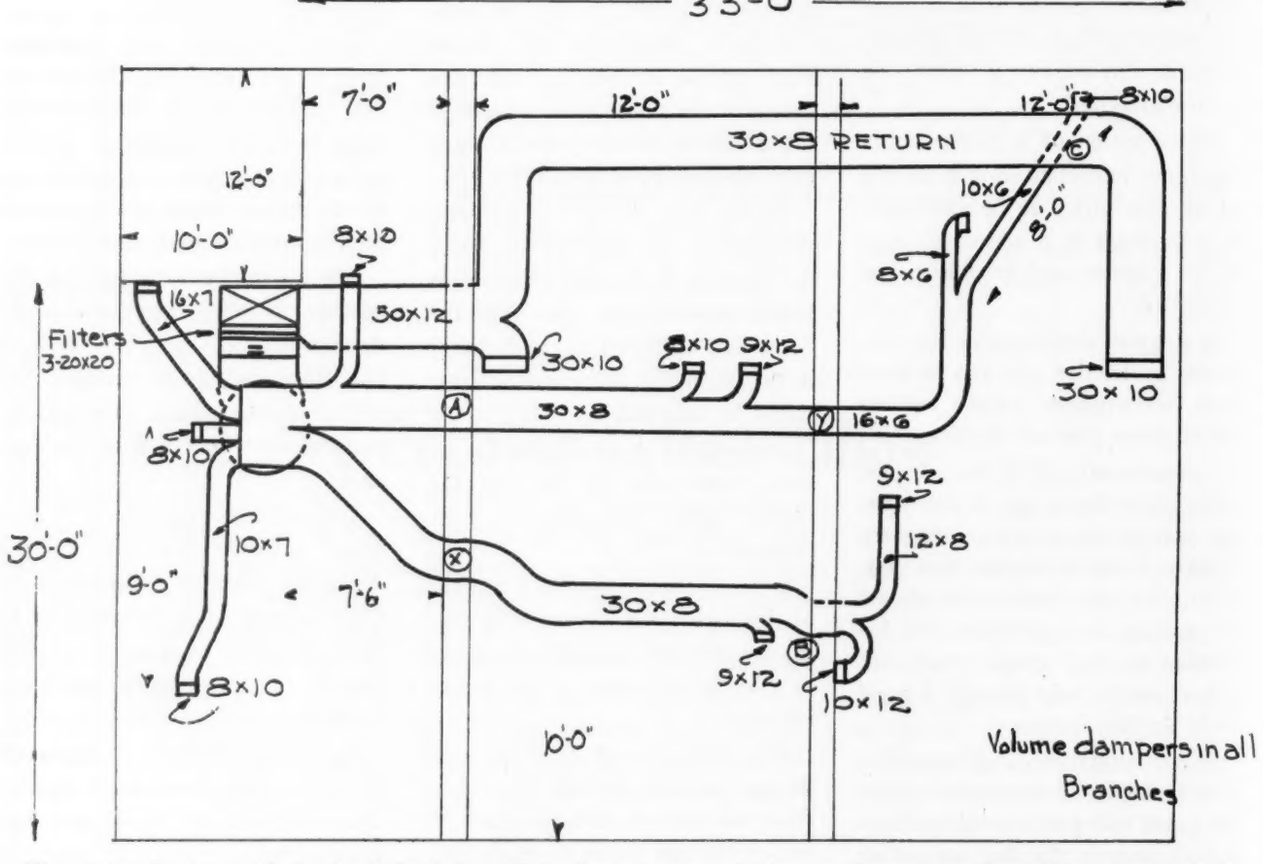
As you will see on the plan this is not a complicated job and the only places that probably cause an undue amount of friction are those marked A, B and C, but still it seems as if the 3000-c.f.m. fan should be able to take care of this.

J. R. Clemens
Great Falls, Mont.

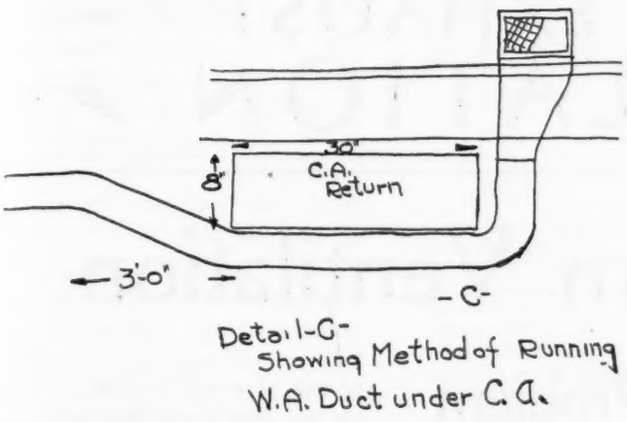
Here are some of the first returns from readers. The first is from J. R. Klemens of Great Falls, Montana. He writes:

"I have just read your Feb. 16th issue of the American Artisan and note on page 42 your request for suggestions on fan heating job on page 42, and felt that I would like to express my opinion.

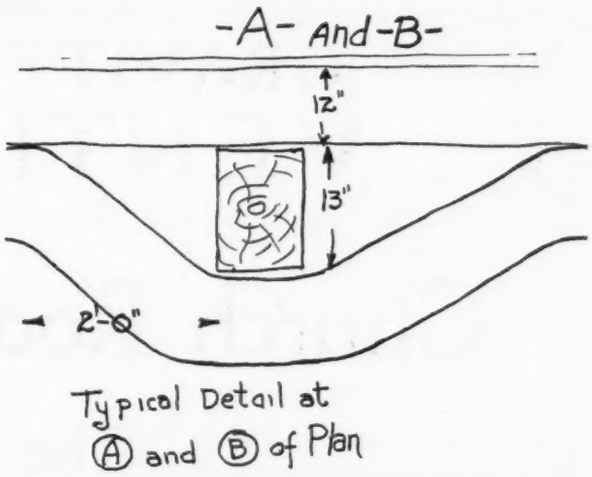
"Since your problem fails to give enough information as to the



The system is comparatively simple in design. Three large trunks and three smaller ones are used. What do you think is holding up the air flow?



This is a detail of the return air and warm air ducts at C. The contractor is somewhat doubtful of his frictional resistance here. What do you think?



At A and B the warm air ducts had to be dropped under one of the supporting beams of the house. Do you feel that this construction impairs air flow here?

trouble encountered and fails to give a floor plan, it is hard to state accurately where the trouble is. However, I believe that the trouble lies in the cold air arrangement.

"In checking over the dimensions given, I assume that the house is a one story building 42x33x9. This would give a cubical content of about 16,200. Basing the fan size on an air change of five times per hour, our fan size would be about 1340 c.f.m. or say 1500 c.f.m. The total of the warm air leads amounts to 742 sq. in. or 5.15 sq. ft. The velocity would then be about 275 ft. per min. in the mains.

"The friction in the straight pipes is negligible; as a friction chart does not give pressure losses under 400 ft. It is apparent then that only friction encountered would be in the elbows, head connection fittings, filters and some loss through the heater. Assuming a 400 ft. velocity, a check-up on the friction pressure loss would give a total of less than ¼-in. S. P. Therefore a fan that will deliver 1500 c.f.m. at ¼-in. S. P. will meet the requirements.

"Although the warm air duct design could be improved somewhat, the layout shown can be balanced to give the required outlet velocities.

"I would suggest that your writer put in split dampers at the branch takeoffs and use volume dampers in the three short individual leads, then open all inside doors between rooms and get an anometer and balance the system to the required c.f.m. for each room.

"If this is done, a recheck with the anometer, with the doors closed will, I am positive, reveal the seat of his trouble. I am satisfied that this job is air bound and that the installation of a return in every room will solve the air delivery problem. If it is not possible to install a return in every room, a grille can be placed in the base of the doors, or they can be vented to the attic, however, I would not recommend that more than one room be vented, as it will increase the infiltration. The only room I would recommend venting would be the bath room."

The second letter comes from O. J. Murphy of the Home Furnace Company at Saginaw, Mich. Mr. Murphy says:

"As the plan you show in your February 16 issue does not include rooms which are to be heated it will be impossible to refigure the heat losses of the plan. However, I can readily see where there would be trouble in heating some of the distant rooms.

"I note the contractor states that he has replaced the original fan with one practically twice its size, yet he has not supplied the amount of return air sufficient for the first fan he used which would supply approximately 1600 c.f.m. The outlets for warm air as I figure total 742 sq. inches, while the most possible return air he could get through the two 30x10 faces would be 376 sq. inches.

"My suggestion to make a proper functioning system out of this would be to use at least five of these faces or their equivalent in not less than four faces, also increase the size of return air box at the furnace to handle the equal amount of return air that the faces would supply as the size as indicated on plan is only 600 sq. inch capacity which is at least 40 per cent short."

Thomas B. Tate
Knoxville, Tenn.

Thomas B. Tate of Knoxville, Tenn., thinks the trouble lies in the fan and the dampering. He says:

"I suggest, for your fan problem on pages 42 and 43, to try a rotary fan. A propellor type fan will not overcome pressure which you have in the front part of your house.

"You will have to install lock damper in the back part of your house so you will have pressure.

"If this overcomes your defects please let me know."

W. J. Vierck
Rockford, Ill.

And the last solution we are going to publish in this issue believes that the system is not well designed and should be redesigned. The letter is from W. J. Vierck of Rockford, Ill. He says:

"I must say that I feel very sorry for our brother in regard to the expense he has already put in on this job, probably amounting to more than the margin he will receive. Had I not known that our brother was sincere in his lay-out I would have regarded it more amusing than otherwise.

"I would be more than pleased to help our brother out with his trouble, but owing to the general

(Contineud on page 41)

GRAVITY EXHAUST VENTILATION

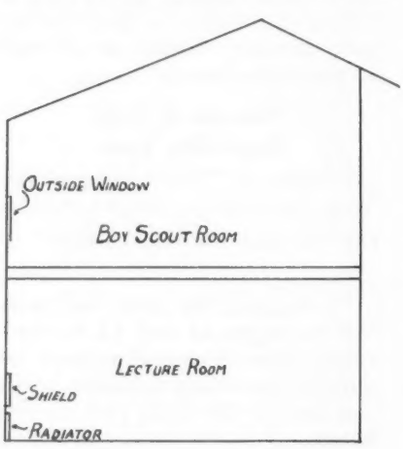
Church Room Ventilation

The Problem

By PAUL R. JORDAN*

I HAVE been asked what I would do to ventilate a room in one of our churches used for a Sunday School room and a lecture room.

As you will see by the sketch there are outside windows on the north and west sides, the south side

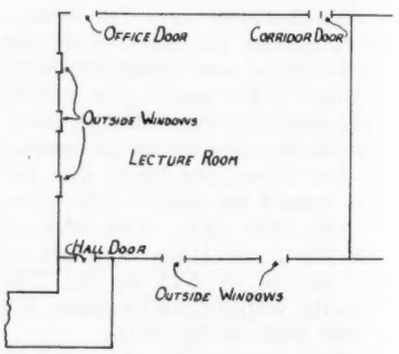


being a blank wall while on the east side are some of the church office rooms and an entrance corridor.

The hall to the west leads to the kitchen, which is only used on lecture nights. Three of the outside windows are covered about one-third of the way up with metal shields. I think these shields were put there to keep the heat from breaking the art glass in the windows. The windows are each made up of two sections with mullion in between and each section has a ventilating door at the bottom about 24 inches square. This is the only ventilation in the room at the present time and this only chills off those close to it and leaves the back of the room unventilated.

The condition is worst on lecture nights, which start with a dinner and end up with a speech. The room is about 35 feet square and as many as 125 people attend the lectures. I would be glad to know how you would ventilate this.

This drawing shows an adjustable lid intake equipped with an automatic regulating valve. On this church room, with its usage for short periods and with the constant supervision it will have while in use, automatic regulation is not a



necessity. Also the extension of the mixing chamber can be cut down, but adjustable lids of the twin type should be used.

The Solution

THERE are a number of "if's" connected with a problem of this kind. There are some things though that can be said definitely. One of these is that the exhaust should be placed in the center of the south wall. If it cannot be placed in the wall itself, then it should be placed beside it. The location of the exhaust is determined by the intake possibilities. Air may be taken in from the east side, north side and the west side. Therefore, the exhaust must be on the south side in order to eliminate dead air pockets and give them distribution.

The nature of this exhaust depends on several different things. If a flue can be installed in the center of the south wall and run up through the roof and capped with either a rotary ventilator or a fan ventilator, then that should be done. If there is no other exhaust fan in the building, a rotary ventilator will answer. If there is, however, an exhaust fan in the building, then this flue should be capped with a fan ventilator in order to overcome the backdrafting tendency set up by the exhaust fan.

If there is an exhaust fan in the kitchen, the movement of air would naturally be from the lecture room toward the kitchen. If there is no exhaust fan in the kitchen, care will have to be exercised to keep kitchen odors from being pulled into the lecture room. This can be accomplished reasonably well by keeping the door connecting these two rooms tightly closed.

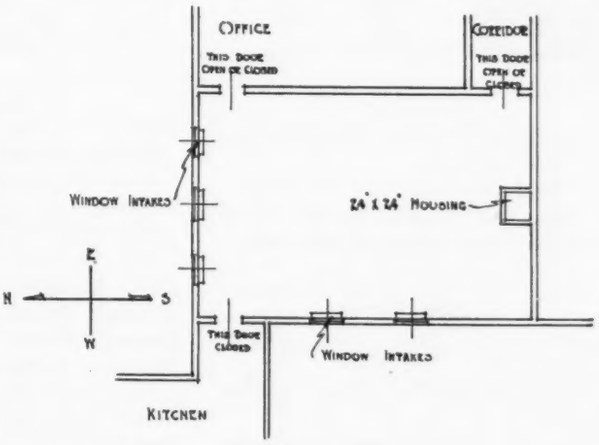
**The Paul R. Jordan Co., ventilator manufacturers, Indianapolis, Ind.*

In case it is not possible to install the flue in the south wall, it can be run up beside the wall. If there is objection to going through the roof either on account of appearance, type of roof or the expense involved, and if a fan is used, it may be exhausted into the Boy Scout room above, provided there is no objection. It is probable that the Boy Scout room and the lecture room will not be used at the same time and in that case such an arrangement would not be objectionable. The flue in this case may be merely a fan housing set on the floor of the room above and running up high enough to exhaust over the heads of any persons in the room. The fan opening should, of course, be screened. The bottom of the flue may open through the ceiling into the room below, in which case it would serve for heat removal as well as ventilation. As to whether or not this flue will have to be dropped down to the floor of the lecture room will depend on how satisfactory the present heating system is and how great the necessity for heat conservation. If the room is well heated, then the addition of 125 adults will make enough more heat that when it is crowded heat removal will be more desirable than heat conservation. If the duct is run to the floor, it should be equipped with a door at the ceiling so that the system can be used for heat removal in the summer as well as ventilation in the winter.

A 24-inch fan with a capacity of 3775 cubic feet of air per minute will furnish 30 cubic feet of air per minute for each of 125 persons. This is ample for ventilation purposes. In case a rotary ventilator is used, a 36-inch will be necessary.

The housing should be 24 by 24 inches and the duct, if it runs through the lecture room, should be the same size. In this latter case, the duct should be stopped 8 inches above the floor if it is open on three sides.

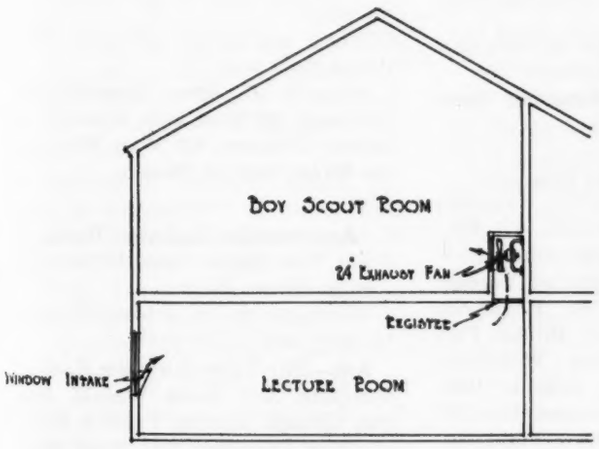
Now as to the matter of intakes. Air from the corridor will be somewhat tempered before it gets to this door. Air from the office will doubtless be well heated before it gets to that door. Here are two sources of intake of tempered or warm air. This gives the janitor an opportunity to manipulate his intakes to conform to temperature requirements.



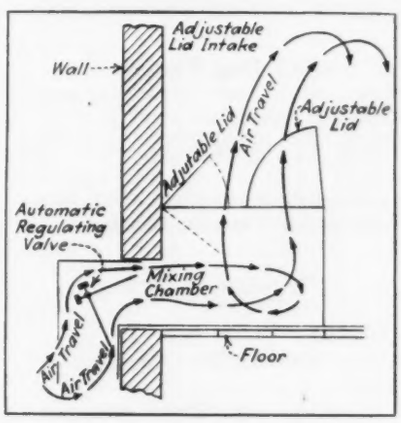
This plan shows the exhaust flue, which is merely a fan housing cut through the floor along the inside wall. This location is central from all inlet openings.

There should be an arrangement to provide for proper intake of outside fresh air. The five double windows furnish a basis for the installation of ten window intakes. These window intakes should be equipped with adjustable lids, preferably of the twin type so that the intaken column of air may be controlled both as to volume and direction, at the will of the janitor. These intakes, if properly designed, will enable the person manipulating them to send a column of air far back into the room before it filters down through the breathing zone to the floor. In conjunction with the door intakes of warm air, they will enable the person controlling them to get about anything he wants in the way of ventilation.

CHURCH ROOM VENTILATION



The elevation shows the fan in place pulling air from the lecture room and blowing it into the Boy Scout room. This plan is not as good as a full height, ventilator-capped flue, but will function satisfactorily.



Detail of a suggested intake with adjustable lids to control air flow and volume.

CAN YOU TELL ME ?

"Unishear"

From Agricola Furnace Company, Inc., Gadsden, Alabama.

Who manufactures the "Unishear"?

Ans.—The Stanley Electric Tool Company, New Britain, Connecticut.

Clothes Dryers

From Western Steel Products Company, Duluth, Minnesota.

Who manufactures portable clothes dryers?

Ans.—K. Hirsch & Son, 1619 North Claremont Avenue, Chicago, Illinois; W. E. Lamneck Company, Columbus, Ohio.

"Reynolds" Furnace

From Electrol, Inc., Chicago, Illinois.

Who in Chicago makes the "Reynolds" furnace?

Ans.—B. F. Reynolds Company, 609 North LaSalle Street.

Slater's Cement

From Freise & Knebes, La Crosse, Wisconsin.

Where can I get Slater's cement?

Ans.—Wm. Connors Paint Manufacturing Company, Troy, New York. *Chicago office:* James L. Perkins, 140 South Dearborn Street.

Address of Carey Company

From Reineman Hardware Company, Burlington, Wisconsin.

What is the address of the Carey Roofing Company?

Ans.—Philip Carey Manufacturing Company, Lockland, Cincinnati, Ohio.

Bull Dog Furnace

From Lincoln Stove Repair Company, Lincoln, Nebraska.

Who manufactures the Bull Dog furnace?

Ans.—Babson Brothers, 2843 Nineteenth Street, Chicago, Illinois.

"Sirocco" Blower

From W. J. O'Neil, Lake Forest, Illinois.

Who manufactures the "Sirocco" blower?

Ans.—American Blower Company, 6000 Russell Street, Detroit, Michigan. *Chicago office:* 228 North La Salle Street.

Stokers

From Keith Furnace Company, Des Moines, Iowa. C. Ed. Smith Furnace Company, New Castle, Pennsylvania.

Who manufactures stokers?

Ans.—Brownell Company, Dayton, Ohio; Combustioneer, Inc., Goshen, Indiana; Detroit Stoker Company, General Motors Building, Detroit, Michigan; Domestic Stoker Company, 7 Dey Street, New York City; Ever-Ready Coal Burner Company, 209 East Baltimore Avenue, Detroit, Michigan; Fire-King Stoker Company, 1160 Roosevelt Road, Indianapolis, Indiana; Germer Stove Company, Erie, Pennsylvania; Iron Fireman Manufacturing Company, 986 Seventeenth Avenue, Portland, Oregon; Motor Stoker Corporation, 250 Park Avenue, New York City; Parry Stoker Company, Cincinnati, Ohio.

Klauer's Conductor Fasteners

From Miller's Tin Shop, Arkansas City, Arkansas.

Where can we get the Klauer's new improved conductor fastener?

Ans.—Klauer Manufacturing Company, Dubuque, Iowa.

Furnace Vacuum Cleaners

From C. Ed. Smith Furnace Company. New Castle, Pennsylvania; Fox Furnace Company, Elyria, Ohio.

Ans.—The Brewer Electric Vacuum Cleaner Company, 852 Blackhawk Street, Chicago, Illinois; Brillion Furnace Company, Brillion, Wisconsin; Densmore & Quinlan, Kenosha, Wisconsin; The Kent Company, Inc., 102 Canal Street, Rome, New York; National Super Service Company, Toledo Factories Building, Toledo, Ohio; B. F. Sturtevant Company, Hyde Park, Boston, Massachusetts.

Gas Furnaces

From Bozeman Sheet Metal Works, Bozeman, Montana.

Who manufactures gas furnaces?

Ans.—Refer to Buyers' Directory, under "Furnaces—Gas," page 52.

Gas Conversion Burners

From K. W. Pringle, Wichita, Kansas. Bozeman Sheet Metal Works, Bozeman, Montana.

Who manufactures gas conversion burners?

Ans.—The Barber Gas Burner Company, 3702 Superior Street, Cleveland, Ohio; Columbia Burner Company, 1645 Dorr Street, Toledo, Ohio; Franklin Gas Burner Company, 821 Eighth Street, Cincinnati, Ohio; Johnson Gas Appliance Company, Cedar Rapids, Iowa; Standard Heating & Radiator Company, 220 Penn Avenue, Pittsburgh, Pennsylvania; The XXth Century Heating & Ventilating Company, Akron, Ohio.

Porcelain Pans

From Eugene Moyemont, Odell, Illinois.

Where can I get porcelain pans, 9½x16½ inches, 2½ inches deep, for steam tables?

Ans.—B. Vollrath Manufacturing Company, 222 North Bank Drive, Chicago, Illinois.

Cotton Rubber Lined Hose

From C. M. Amspoker, East Liberty, Ohio.

Where can we get 2½-inch cotton rubber lined hose?

Ans.—W. D. Allen Manufacturing Company, 566 West Lake Street; U. S. Rubber Company, 428 West Washington Street; both of Chicago.

Automobile Radiator Parts

From West Akron Sheet Metal Company, Akron, Ohio.

Where can we buy automobile radiator parts and accessories?

Ans.—The Faber-Schneider Radiator Company, 2317 South Wabash Avenue, Chicago, Illinois; Fedders Manufacturing Company, 5101 West Madison Street, Chicago, Illinois; G. & O. Manufacturing Company, New Haven, Connecticut; McCord Manufacturing Company, Detroit, Michigan; Perfex Radiator Company, Racine, Wisconsin.

Name Plates

From Phillips & Buttorff Manufacturing Company, Nashville, Tennessee.

Where can we get name plates?

Ans.—Etching Company of America, 1520 Montana Street; General Etching & Manufacturing Company, 3070 West Grand Avenue; C. H. Hanson Company, 303 West Erie Street; Stanley Manufacturing Company, 64 West Randolph Street; all of Chicago.

ASSOCIATION ACTIVITIES

National Warm Air Ass'n Spring Program

The National Warm Air Heating Association announces the program for the 1931 Spring Meeting to be held in the Deshler-Wallick Hotel, Columbus. The dates of the meeting are April 22 and 23.

In addition to general sessions there will be group meetings of manufacturers and one of dealers with special programs.

All phases of the industry will be covered, including air conditioning, use of different fuels, better business, research, forced air and commercial conditions.

Here is the program:

Wednesday Morning, April 22

9:00 O'Clock—Registration

GROUP MEETINGS

10:00 O'Clock—Manufacturers' Session
President Triggs, Presiding

"Consideration of Proposed Merger of National Warm Air Heating Association and Warm Air Furnace Institute."

JOINT COMMITTEE ON MERGER

Representing Warm Air Furnace Institute—Clarence Olsen, W. L. McGrath, A. W. Wrieden, H. P. Mueller, President Wise.

Representing National Warm Air Heating Association—I. L. Jones, James Brown, E. B. Langenberg, Arthur F. Frazee, President Triggs.

"Our Better Business Activities"
I. L. Jones, Chairman

1:00 O'Clock—Dealers' Session
Mr. Jack Stowell, Presiding

"Air Conditioning the American Home"
James C. Miles, Cleveland, Ohio

"Modern Installations"
Gilbert E. Olson, Omaha, Nebraska

"Small Stokers as Adapted to Warm Air Furnaces"
Lorin W. Smith, Jr., Goshen, Indiana

Wednesday Afternoon

2:00 O'Clock—First General Session
Welcome and Message—President Triggs

"Warm Air Furnace Heating with Gas or Oil"
A. M. Daniels, Washington, D. C.

"Experience in Residential Air Conditioning"
V. S. Day, Newark, N. J.

"Progress Made by the Committee of Ten"
E. B. Langenberg, *our Representative*
C. B. Huntress, *Executive Secretary, National Coal Association*

"Phases of Forced Air Heating"
Fred Bishop, Kalamazoo, Michigan

Wednesday Evening

6:30 O'Clock—Banquet
Deshler-Wallick Hotel

Thursday, April 23

9:30 O'Clock—Second General Session
"Our Research Activity"
C. M. Lyman, Chairman, Presiding

"Summarized Conclusions of Latest Information Relative to Our Research Work"
Professor A. C. Willard
Professor A. P. Kratz
S. Konzo, *Special Research Assistant*
Discussion

OVERHEAD

(Continued from page 21)

estimates. Simply because you do not know how much of this labor total was productive and how much was non-productive. Not knowing this important fact, you cannot say what your actual overhead was for the year just closed, therefore, you are at a loss to estimate what your overhead will be during the current year.

You would not think of charging your rent into material account, because Rent is not Material. For the same reason, Indirect Labor is not Direct Labor, and should not be charged into the same account. One is Overhead, and the other is an element of direct cost of the work done. Material and Direct Labor form the Direct Cost; while Rent and Indirect Labor, along with the other EXPENSES, constitute your Overhead.

THE FAN PROBLEM

(Continued from page 37)

lay-out before me, I am not in a position to help him very much. His long air spaces and square bends, his hot air ducts under the cold air, his cold air ducts under the timbers, all these tend to loop the loop, that is what is wrong. The Air Force System that so many an installer has gone wild over is all right in places, but it needs a little common sense to make them work right."

There are other replies which will be published. These future solutions are accompanied by drawings and these will be reproduced.

It's not too late to get in on this problem. If you feel you can offer a solution, let's have it.

American Oil Burner Association—April 13 to 18, at Ben Franklin Hotel, Philadelphia, Pa. Harry F. Tapp, Executive Secretary, 350 Madison Avenue, New York, N. Y.

New York State Sheet Metal Contractors' Association—April 15 and 16, at Powers Hotel, Rochester, N. Y. Dayton Hessler, Secretary, 913 North State Street, Syracuse, N. Y.

National Warm Air Heating Association—April 22, 23, at Deshler-Wallick Hotel, Columbus, Ohio. Allen W. Williams, Managing Director, 3440 A. I. U. Building, Columbus, Ohio.

Western Hot Air Club—May 11, at Chicago. Semi-annual Pow-Wow. J. Harvey Manny, Chairman Entertainment Committee, 213 W. Austin Avenue, Chicago.

National Association Sheet Metal Contractors—May 13 to 15, at Congress Hotel, Chicago, Ill. A. B. Rysdon, Secretary, Associated Sheet Metal Employers of Chicago, 350 North Clark Street, Chicago.

Sheet Metal Contractors' Association of Ilinois—May 12, at Congress Hotel, Chicago. Chas. L. Radtke, Secretary, La Salle, Ill.

Travelers Auxiliary to the Sheet Metal Contractors' Association of Illinois—May 12, at Congress Hotel, Chicago. E. Cohn, Secretary, 6756 Crandon Avenue, Chicago.

National Association of Sheet Metal Distributors—May 20 and 21, at William Penn Hotel, Pittsburgh, Pa. George A. Fernley, Secretary-Treasurer, 505 Arch Street, Philadelphia, Pa.

NEW ITEMS and NEWS ITEMS
From and about the Manufacturers and Jobbers

Fred L. Nesbit Has Passed On

"Fred L. Nesbit passed away suddenly today. The industry has lost a real builder, and we have lost a true friend" is the message that came to us from Los Angeles from Ralph Blanchard on Saturday.

"Fred Nesbit has passed. Nothing that can near reach a description of his worth to the industry can be written, try as hard as you may. When Fred joined the slowly moving caravan of heating men, they were in the depths of despair. His convictions never wavered an inch. His perseverence and bull dog tenacity were the only two things that could bring the heating industry out of its despair. His joining hands with the whole industry was just the thing needed to start it into better paths, and had it not been for Fred Nesbit with his full and complete understanding of the situation, the heating industry today would be 25 years behind the times. With his passing, the industry loses its outstanding figure," Roy Walker writes from Los Angeles.

Fred L. Nesbit

And as we go to press come letters of sorrow from George Harms, Herbert Symonds, John Fehlig and others who knew him well, extolling the work that Fred Nesbit did for the industry and showing the love and affection borne him by even those whom he fought hardest and who were his strongest competitors in business.

After spending several years on the road selling furnaces, in 1915 joining hands with George Harms, Mr. Nesbit formed the Standard Furnace and Supply Company at Omaha, serving as president and general manager of the company from its formation until the time of his passing.

Mr. Nesbit had always been active in association affairs; he was one of the organizers of the old Western Furnace and Supply Association, the National Warm Air Heating Association and the National Association of Sheet Metal Contractors, and the warm air heating industry in no small measure is indebted to Fred Nesbit for the Standard Code. He fought against great odds to put the first Warm Air Heating Code in effect at Omaha, over twenty years ago, and served faithfully and unselfishly on all code committees, always ready and anxious to give of his time and his experience to help advance an industry of which he was a vital part.

Mr. Nesbit was very active in civic affairs in his home city and as one of the directors of the Chamber of Commerce, did much to bring better roads in and out of Omaha.

Two years ago he was compelled to withdraw from active management of his business, and since that time both he and Mrs. Nesbit made their home in Los Angeles, his son, Earl, having taken over the active management of the company.

Saturday morning Mr. Nesbit seemed in splendid health, having just returned from a four days' automobile tour with Mrs. Nesbit, his son, Earl, and the latter's wife, who were visiting him, and his end came quite suddenly from a heart attack, which he suffered while at the garage waiting for his car.

The Warm Air Heating industry in the passing of Fred Nesbit has lost one whose work will live on, whose place it will be difficult to fill and whose absence will be deeply felt by many.

Voorhees Becomes Heating Engineer for Am-Pe'-Co. Organization

From E. A. Francis, president of the American Machine Products Company, of Marshalltown, Iowa, comes the announcement that G. A. Voorhees has joined their organization as heating engineer with headquarters at Indianapolis.

Mr. Voorhees, who is a member of the American Society of Heating and Ventilating Engineers and an associate member of the American Society of Mechanical Engineers, has had years of practical experience, and the Am-Pe'-Co organization are fortunate in securing his services to take care of the engineering requirements on their line of blowers and air washers.

Out of Town Visitors

During the past week it has been the pleasure of AMERICAN ARTISAN to receive visits from a number of our good friends: Hugh Hammond, of the Armstrong Co., Columbus; E. C. Fox and Blair Quick, of The Independent Register & Mfg. Co. of Cleveland; F. C. Sheldon, of the Yoder Co., Cleveland, and his Western representative, Harry G. Masten; J. B. Bernstein, of Omaha, and W. C. Markle, secretary of the National Association of Sheet Metal Contractors.

We are always glad to have our friends drop in on us when in Chicago, especially when they show the optimistic spirit these folks do.

A. Gehri and Company Open Eastern Branch Office

A. Gehri and Company, Tacoma, Washington, manufacturers of silent air blowers and washers and complete air conditioning equipment, have opened an eastern branch office in Baltimore, Maryland.

The address of the new branch is Room 1526, Baltimore Trust Building —Baltimore, Light and Redwood Streets, Baltimore.

T. MacDonald from the factory in Tacoma is the manager of the eastern division and will be located in the Baltimore office.

Warehouse facilities will be maintained in Baltimore.

Meyer Furnace Co., Has New "Conditioned" Air Unit

The Meyer Furnace Company, Peoria, Ill., manufacturers of Weir furnaces, are introducing to the warm air heating industry a new furnace, to be known as the "Conditioned Air" unit. This new heating unit contains many new and interesting details. The photographs show two views of the new unit.

This new unit is decidedly in keeping with the trend of the times toward complete heating units, square casings and forced air accompanied by such color finish that the plant is a credit to any basement.

One of the most important features is the unique design and construction of the casing. The casing is square and is made up in just four principal pieces, each of which is complete with its portion of the baffling. The whole casing can be assembled in a very short time without the use of any bolts or screws.

Also the blower and filters have been so arranged that provision for bypassing air for gravity circulation is assured.

Here are some of the features stressed by the manufacturer:

The furnace is of riveted-welded construction, absolutely and permanently gas and fume tight.

The casing is rectangular in shape, with air passageways scientifically designed to carry away heat proportionately from the large heater surface and with mixing chamber above to bring all air to an even temperature before it enters the ducts; there is an insulating air space on all sides to prevent radiation loss to basement.

The blower is a low-speed centrifugal type with double inlet, designed expressly for heating and ventilating work and provided with automatic bypass dampers for gravity circulation.

The blower control is fully automatic, located in heater bonnet, starts motor when air temperature reaches any desired point and stops motor at any lower temperature; easily adjusted.

The humidifier consists of a vitreous enameled vaporizer and float valve controlling water level.

The front of the heater is finished in high heat resisting "Silvertone" while heater casing and blower and filter housing are Coolie blue with black trim.

Warm Air Furnace Fan Co. Organizes Canadian Company

The Warm Air Furnace Fan Co., Cleveland, manufacturers of the Miles Automatic Furnace Fan, announces the organization of a Canadian subsidiary company to manufacture and sell under the Miles patents.

This company will be known as the Miles Automatic Furnace Fans, Ltd., at Ingersoll, Ontario. J. W. Jamieson is president; F. C. Moore, vice-president, and N. R. Ofield, secretary and treasurer.

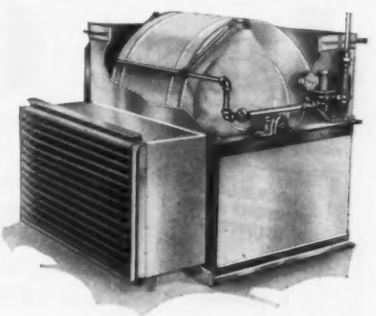
W. D. Clifton, formerly of the General Steel Wares, London, Ontario, and one of the company's first students, is in charge of engineering and sales. J. C. Miles will be a director of the company with no active part except in an advisory capacity.

The Am-Pe-Co Air Washer-Blower

The AM-PE-CO AIR WASHER-BLOWER through a very fine mist, or fog, is designed to thoroughly clean the air and mix it with moisture before it is delivered to the heater so that the air delivered throughout the home is clean, pure, and healthful; it also carries with it a humidity that reminds one of a joyous spring morning—all contained in a single unit.

The AM-PE-CO AIR WASHER-BLOWER is a very simple and compact unit made of heavy gauge galvanized iron throughout. The interior is coated with red lead and a waterproof enamel. The nozzles at either inlet opening produce a large fan-shaped spray. The fog-like mist produced by these nozzles is drawn in with the air and then churned in the scroll so that the air becomes thoroughly washed and mixed. The deflector in the outlet opening prevents any water being carried through. There is a drain connection in the floor of each unit to which can be attached a pipe for carrying away the waste water. A hand-hole, tightly sealed, is provided on each side of the unit, by which access can be had to the nozzles.

The water supply is controlled by using an Arco Solenoid Valve connected so as to automatically turn on the spray when the blower is set in operation, and automatically closes when the blower stops.



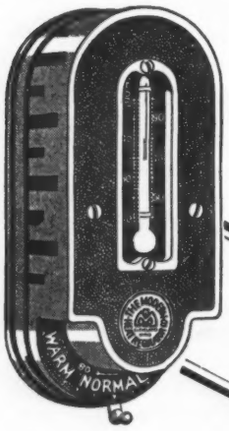
Motors furnished are AC 110-220 V., 60 cycle DC motors. Motors for other specifications furnished at special prices.

The unit is made in the following sizes and capacities.

No.	Motor	CFM Ls.	CFM 2nd	CFM High	Price
5A	1/6	650	720	800	$175.00
6A	1/6	800	900	1000	197.00
8A	1/6	1100	1200	1300	207.00
10A	1/6	1300	1400	1500	217.00
12A	1/4	1600	1800	2000	250.00
13A	1/3	2000	2250	2500	282.00
15A	1/2	2500	3000	3500	330.00
17A	1/2	3000	3500	4000	354.00
20A	1/2	3500	4200	4800	410.00
25A	3/4	4000	4800	5500	440.00
30A	1	4500	5200	6000	480.00
35A	1	6000	6500	7000	525.00
40A	1 1/2	7500	8200	9000	550.00

The water consumption on units up to and including 15A is as follows:

At 30 lb. pressure.....18 gal. per hour
At 25 lb. pressure.....17 gal. per hour
At 20 lb. pressure.....15 gal. per hour



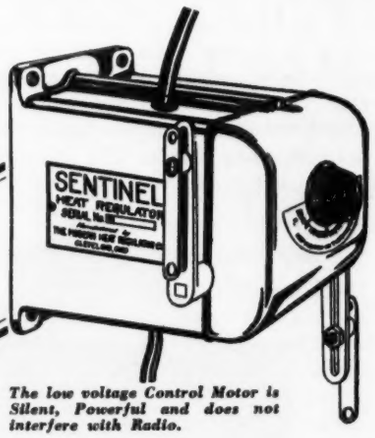
"SENTINEL" -Heat Regulator-

COMFORT
CONVENIENCE
NO HEAT WORRIES
FOR YOUR CUSTOMERS

Beautiful Walnut Moulded Bakelite Thermostat — One degree operation

LIST PRICE
$48
DEALER'S PRICE ON REQUEST

Positive Silent Automatic Control. No Radio Interference



The low voltage Control Motor is Silent, Powerful and does not interfere with Radio.

Let the "SENTINEL" guard your customers' health and keep the home at an even heat automatically.

Besides the "SENTINEL" is easily installed, fully guaranteed and will make a real profit for you.

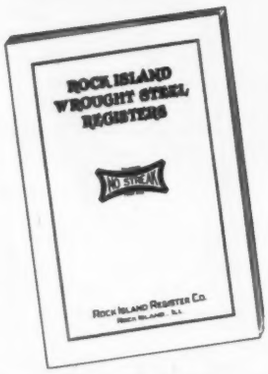
Let us tell you all about our proposition—Write today.

THE MODERN HEAT REGULATOR COMPANY
Manufacturers of MODERN *and* SENTINEL REGULATORS
CLEVELAND, OHIO

National Distributors
TUTTLE & BAILEY MFG. CO.
New York, N. Y.

Branch Offices and stocks at Boston, Mass., Chicago, Ill., Kansas City, Mo., Los Angeles, Calif., and Bridgeburgh, Canada

Just Out



This
NEW
complete catalog
NO. 10
of

ROCK ISLAND
REGISTERS AND GRILLES
FURNACE SUPPLIES, ETC.

Send This Coupon

ROCK ISLAND REGISTER COMPANY
Rock Island, Illinois

Send me your catalog just off the press.

Name.....

Street..... *City*..... *State*.....

REGISTERS OF THE HOUR

AUER MAKES A GRILLE AND REGISTER TO MEET EVERY NEED

AUER REGISTER COMPANY
3608 Payne Avenue CLEVELAND, OHIO

WATERBURY
SEAMLESS FURNACE
REG. U.S. PAT. OFF. PIPE OR PIPELESS

The Waterman-Waterbury Co.
1122 Jackson Street N. E.
Minneapolis, Minn.

Say you saw it in AMERICAN ARTISAN—Thank you!

ANNOUNCING

4 New Model

Faultless Furnaces

Acquaint yourself with the comprehensive new line of Faultless Furnaces . . . write for facts and figures . . . get our dealer proposition.

THE GRAFF FURNACE CO.
Scranton, Pa.

New York City Sales Office: 116-118 Wooster St.

For Any Demand
You May Make

in

STEEL FLANGES

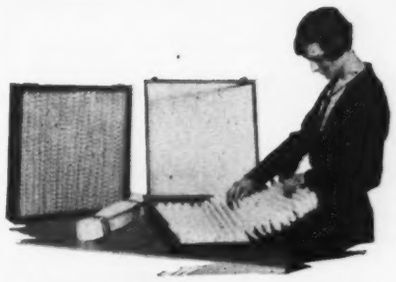
Whatever the size or form—from stock sizes in rolled steel angle flanges to specially made bar shapes—you can get it quickly and economically. Just remember "Chicago Metal—Flanges." By special manufacturing methods you are assured of uniform accuracy by which your jobs can be smoothly and quickly handled.

Write for Illustrated List of Types and Prices

CHICAGO METAL MANUFACTURING CO.
3715 South Rockwell St. Chicago, Ill.

WHEN YOU'RE THROUGH WITH IT

THROW IT AWAY!



"WASHDAYS"
ARE ELIMINATED WITH THE NEW

"KRIMPAK" AIR FILTER

no oil—no cleaning equipment—no mess

THE filter medium is a reinforced dry fabric which stops even the microscopic particles so objectionable in warm air heating systems. The deep crimping gives it five times the usual surface area, resulting in low resistance and long periods between changes—three to four months on average jobs. And when you make the change you start again with a new filter.

"KRIMPAK" medium comes in a compact package and expands like an accordion. Fillers are so low in cost you can't afford to recondition them. Replacements are made in a jiffy without soiling the hands.

FURNACE INSTALLATION

Be prepared to give your customer the facts about "Krimpak"—the new dry fabric air filter—ideal for old and new furnace installations.

Write for complete descriptive circular today

INDEPENDENT AIR FILTER CO.
29 SOUTH CLINTON STREET
CHICAGO

MARSHALLTOWN THE MARSHALLTOWN LINE SHEARS

No. 18

SHEARS THAT CUT

That's what you're looking for—shears that will save money for you—shears that stand the gaff.

Install at least one type of Marshalltown throatless shears in your shop. Do it now!

SHEARS FOR EVERY JOB: CUTTING CAPACITY UP TO ½".

The MARSHALLTOWN line is complete—a shear for every use.

THE CATALOGUE TELLS THE STORY—WRITE FOR IT

SPECIFICATIONS

CAPACITY—
18 gauge and lighter — 1¾" radius.

CUTTERS—
2"x1½"—high grade tool steel. Slightly knurled to feed material.

ADJUSTMENT—
One bolt. Instructions furnished.

SIZE AND MATERIAL—
Height 19½"; head cast iron; base cast iron; gears steel and cast iron. Shipping weight 45 lbs.

MARSHALLTOWN MFG. CO. MARSHALLTOWN IOWA

THE "BIG THREE" IN AIR CONDITIONING

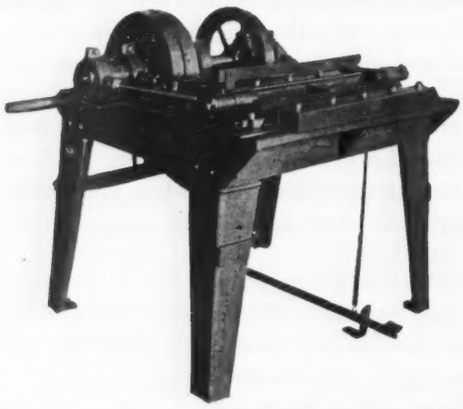
SILENTAIR FAN
(Blower Type)
SILENTAIR AIR WASHER
SILENTAIR AIR FILTER

Write for Literature

SILENTAIR
AIR CONDITIONING UNITS

Manufactured by
A. GEHRI & CO.
Tacoma, Washington

DISTRIBUTORS IN ALL PRINCIPAL CITIES



Yoder L-300 Stove Pipe Seaming Machine

THIS machine is built with a combination set of 3 pairs of dies, and completely forms the edges of Stove Pipe Sheets, ready for seaming. The bed is of ample proportions, cast in one piece, including all bearings. The shafts are large and all parts sufficiently heavy to permit of rapid operation and produce accurate work.

The dies are accessible, permitting of quick and easy adjustment and are of sufficient length to seam 31" sheets, of No. 22 gauge or lighter. Curling rolls can be attached to frame of the machine, permitting seaming and curling pipe with one handling. Net weight—2700 pounds.

THE YODER COMPANY
W. 55 ST. and WALWORTH AVE. CLEVELAND, OHIO
PLATE AND SHEET METAL MACHINERY SPECIALISTS
Harry G. Masten Company, 4119 N. Lawler Ave., Chicago Sales Representative

Yes SIR---
SHEET METAL
and
ROOFING SUPPLIES

Systematically listed in this catalog for quick reference and CARRIED IN STOCK BY JOBBERS EVERYWHERE FOR QUICK DELIVERIES.

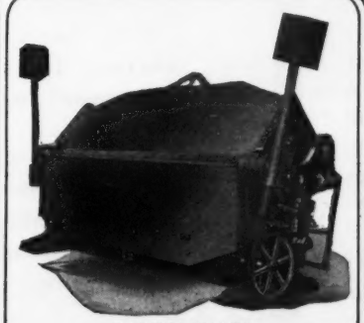
Write for this catalog today *Finest Quality—Fairest Price*

BERGER BROS. COMPANY
229 TO 237 ARCH ST. PHILADELPHIA, PA.
Western Office: 140 So. Dearborn St., Chicago

"American Seal"
FURNACE CEMENT
Roof Cement—Stove Putty
Plumbers Putty
PAINTS AND SPECIALTIES
WILLIAM CONNORS PAINT MFG. CO.
Established 1852
TROY NEW YORK
JAMES L. PERKINS, Western Distributor
140 South Dearborn Street, Chicago, Illinois

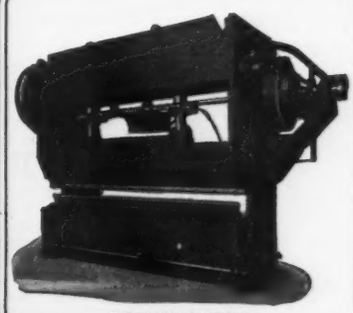
CHICAGO
STEEL BENDING BRAKES AND FORMING PRESSES

The perfected result of over 30 years experience in the manufacture of sheet metal bending machines. Over 25,000 machines in use.



POWER BRAKE

Hand Brakes
Cornice Brakes
Power Brakes
Box and Pan Brakes
Forming Presses
Special Brakes and Presses



FORMING PRESS

The most complete and up-to-date line of sheet and plate bending and forming machines in the world. Lengths, 3 to 16 feet, with capacity to bend from the lightest metals up to ¾ in. plate, cold.

DREIS & KRUMP MANUFACTURING CO.
7404 Loomis Street · Chicago

H&C AUTOMATIC HEAT CONTROL

GET YOUR SHARE OF THE BIG PROFITS BEING MADE WITH

H&C AUTOMATIC HEAT CONTROL

It's an outstanding product—100% reliable—none better built. Sells way below anything at all comparable. Many dealers throughout the country are making a real killing with it. Get your share of this business. Write for complete details NOW.

LIST PRICE
$45.00
Including every necessary fitting and ball bearing pulleys.

Carried by all leading jobbers

Hart & Cooley Mfg. Co.
61 W. Kinzie Street
CHICAGO

H&C AUTOMATIC HEAT CONTROL

Fun for the CHILDREN

"*Fun* *but—* for the children.. *but*"

is one of several small folders with which contractors using Anaconda Copper are reminding customers of the economy of durable sheet metal work. Over half a million of these were furnished free to contractors last year, all specially imprinted with their firm names and addresses. The American Brass Company, Waterbury, Conn.

ANACONDA COPPER

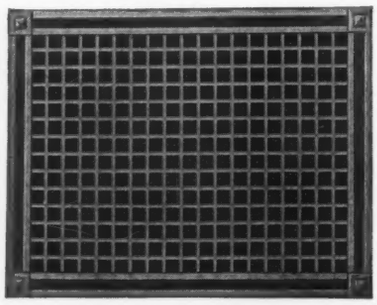
Mention AMERICAN ARTISAN in your reply—Thank you!

Grilframe

(Trade Mark)

THE NEW GRILLE CONSTRUCTION

Beautiful—Convenient—Economical



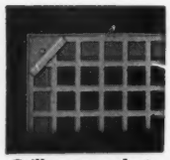
"Grilframe" parts ready for assembly (Front view)

"GRILFRAME"

is completely assembled from stock parts. This new method makes possible 48 hour service

Distributors are being appointed in principal cities

SEND FOR CATALOG



Grille secured to frame with lug (Back view)

H & K GRILLES

H & K grilles are well known throughout the country and for excellence of workmanship and beauty of design are not surpassed. Grilframe construction is adapted to all of H & K grille designs and rounds out the line of our punched metal grilles. Ask for catalog No. 28.

PERFORATED METAL

EVERY type of perforated metal from the finest to the largest standard sizes are within the scope of our equipment. This means round, oblong, slot, square holes and many special shapes suitable for metal of different kinds and thicknesses.

Write us for perforated metal of every sort

THE HARRINGTON & KING PERFORATING COMPANY

5649 Fillmore Street Chicago, Ill.

New York Office: 114 Liberty Street

X-L-ALL

RUGGED WELDED STEEL FURNACES

HERE ARE A FEW X-L-ALL FEATURES

1. **Rugged construction built to stand the wear and tear of hardest uses.**
2. **Oversize combustion chamber, assuring complete fuel consumption.**
3. **Extra heavy grates. They will wear for years.**
4. **Attractive construction with accessibility to the interior.**

BUT LET TELL

THIS BOOKLET YOU ALL OF THEM

Write for the X-L-ALL booklet. It tells the story of the evolution of steel furnaces, proper installations, and brings you the story of a most unusual dealer proposition. Write for it today!

Deshler Foundry & Machine Works

140 SOUTH EAST AVENUE

DESHLER OHIO

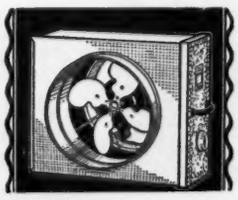
THE UNIT TO SELL

A-C *Thermostatically Controlled* *Automatic* HEAT BOOSTER

MAKES EVERY INSTALLATION BETTER

Here's a unit which makes every installation a better one and makes a profit for you. Install the A-C for customer satisfaction and a better profit.

WRITE FOR DESCRIPTIVE CATALOG AND NAME OF NEAREST JOBBER



A-C Manufacturing Co.

417 Sherman Ave., Pontiac, Ill.

NEW

CASING IN RED

MONCRIEF Aristocrat

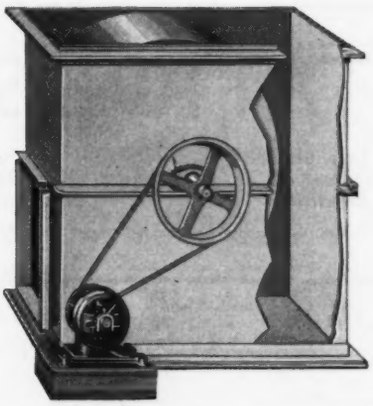
Attractive, modern, finished in cardinal red. You can get business at a profit with this newest Series "C" model.

Send for circular

The HENRY FURNACE & FOUNDRY CO.

3471 East 49th Street

Cleveland, Ohio



Every Livewire Dealer Needs This Blower

—for added profits in forced air circulation!

NOW you can guarantee positive and uniform heat circulation in every room in the house. Am-pe-co, the improved Rotary Blower, has exclusive features that insure fully balanced air distribution to both inlets—vitally essential to perfect blower operation. Furnacestat or thermostat control; quiet; non-leaking ring oil bearings; low operating cost. Am-pe-co meets the need for a really efficient blower that will net the dealer a **good profit.**

Built with or without automatic dampers which open when blowers stop, for gravity circulation. Get a bigger share of this forced air business, and make more money. Send today for complete detailed literature.

AMERICAN MACHINE PRODUCTS COMPANY
Marshalltown, Iowa
For 15 Years Manufacturers of Precision Products

AM-PE-CO
BLOWER

HEAT RADIATING FINS

FOR OVER 40 YEARS

VICTOR

Steel Furnaces

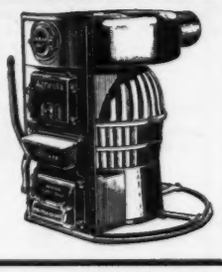
HAVE BEEN GOOD FURNACES

Now! 20% Increased Heating Capacity with "Heat Fins"

HALL-NEAL FURNACE COMPANY
1322-32 No. Capital Ave. Indianapolis, Ind.

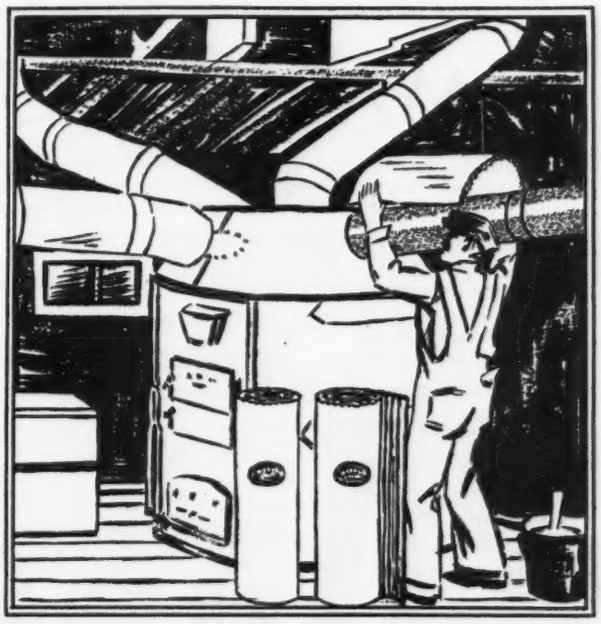
Genuine Agricola

REPAIR PARTS



To be sure of perfect fitting castings and parts, order only genuine AGRICOLA Repair Parts. Prompt shipments.

AGRICOLA FURNACE CO., Inc.
Gadsden, Alabama
Offices in principal cities



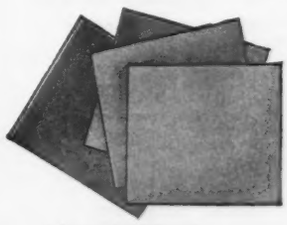
Keep All the Heat Up in the House

With Stanocel Corrugated Asbestos Paper

UP in the house is where your customers want the heat—not in the basement.

You can greatly improve the appearance and increase the efficiency of your warm air furnace installations by covering the pipes and casing with **Corrugated Asbestos Paper**—a flexible insulation material especially suited for wrapping furnace pipes.

Asbestos Paper
8-10-12-14-16-32 lbs. per 100 square feet. 18" and 36" wide—50 or 100 lb. Rolls.



Asbestos Mill Board
⅛-¼-½" thick in sheets 42x48

Standard Corrugated Asbestos Paper
A flexible insulation ⅛, 1/6 or ¼ inch thick. Especially adapted for wrapping furnace pipes.

You can add to your profits and increase customer satisfaction with Standard Asbestos Products

STANDARD ASBESTOS MANUFACTURING CO.

OF CHICAGO
820 WEST LAKE ST., CHICAGO

Branch Office
2333 Pine St.
St. Louis, Mo.

Sales Representatives
F. W. Forward, Elkhart, Ind.
H. T. Luckow, 1426 Main St., Kansas City, Mo.

~ MARKET QUOTATIONS ~

AMERICAN ARTISAN is the only publication quoting Prices on Metals, Sheet Metal Equipment and Supplies, Warm Air Heating Supplies and Accessories, corrected bi-weekly. These quotations are not guaranteed but are obtained from reliable sources and reflect nation-wide market conditions at the time of going to press.

NOTE—These prices are Chicago Warehouse Prices to which must be added territory differentials

METALS

PIG IRON

Chicago Fdy., No. 2	$17.50
Southern Fdy. No. 2	17.01
Lake Superior Charcoal	27.04
Malleable	17.50

FIRST QUALITY BRIGHT CHARCOAL TIN PLATES

IC	20x28	112 sheets	$23.80
IX	20x28		27.45
IXX	20x28	56 sheets	14.95
IXXX	20x28		16.10
IXXXX	20x28		17.35

TERNE PLATES

	Per Box
IC 20x28, 40-lb. 112 sheets	$23.50
IX 20x28, 40-lb. 112 sheets	26.00
IC 20x28, 25-lb. 112 sheets	20.05
IX 20x28, 25-lb. 112 sheets	22.90
IC 20x28, 20-lb. 112 sheets	18.55
IV 20x28, 20-lb. 112 sheets	21.35

"ARMCO" INGOT IRON PLATES

No. 8 ga.—110 lbs.	$4.15
3/16 in.—100 lbs.	4.05
¼ in.—100 lbs.	3.85

COKE PLATES

Cokes, 80 lbs., base, 20x28	$12.00
Cokes, 90 lbs., base, 20x28	12.20
Cokes, 100 lbs., base, 20x28	13.75
Cokes, 107 lbs., base, IC, 20x28	12.75
Cokes, 135 lbs., base, IX, 20x28	14.75
Cokes, 155 lbs., base, 2X, 56 sheets	8.50
Cokes, 175 lbs., base, 3X, 56 sheets	9.35
Cokes, 195 lbs., base, 4X, 56 sheets	10.25

BLUE ANNEALED SHEETS

Base 10 ga.	per 100 lbs.	$3.35
"Armco" 10 ga.	per 100 lbs.	4.15

ONE PASS COLD ROLLED BLACK

No. 18-20	per 100 lbs.	$3.55
No. 22	per 100 lbs.	3.70
No. 24	per 100 lbs.	3.75
No. 26	per 100 lbs.	3.85
No. 27	per 100 lbs.	3.90
No. 28	per 100 lbs.	4.00

GALVANIZED

No. 16	per 100 lbs.	$3.85
No. 18	per 100 lbs.	4.00
No. 20	per 100 lbs.	4.15
No. 22	per 100 lbs.	4.20
(Standard differentials on extras to apply)		
No. 24	per 100 lbs.	$4.35
No. 26	per 100 lbs.	4.60
No. 27	per 100 lbs.	4.70
No. 28	per 100 lbs.	4.85
"Armco" 24	per 100 lbs.	5.85

BAR SOLDER

Warranted 50-50	per 100 lbs.	$19.25
45-55	per 100 lbs.	17.00
48-52	per 100 lbs.	17.75
Plumbers'	per 100 lbs.	15.50

ZINC

In Slabs	$5.00

SHEET ZINC

Cask Lots (600 lbs.)	$12.00
Sheet Lots (100 lbs.)	13.00

BRASS

Sheets, Chicago base	17 ⅝ c
Tubing, brazed, Chicago base	24 ⅞ c
Tubing, seamless, Chicago base	22 ¼ c
Wire, Chicago base	17 ⅞ c
Rods, Chicago base	15 ⅝ c

COPPER

Sheets, Chicago base	19 ⅞ c
Tubing seamless, Chicago base	22 ⅝ c
Wire, plain rd., 8 B. & S. Ga. and heavier	12 ⅝ c

LEAD

American Pig	$6.00
Bar	7.50

TIN

Bar Tin	per 100 lbs.	$33.00
Pig Tin	per 100 lbs.	32.00

SHEET METAL SUPPLIES, WARM AIR FURNACE FITTINGS AND ACCESSORIES

ASBESTOS

Paper up to 1/16	5c per lb.
Roll board	5 ½ c per lb.
Mill board 3/32 to ¼	5 ½ c per lb.
Corrugated paper (250 sq. ft. per roll)	$4.00 per roll

ASBESTOS SEGMENTS

8 in.	per 25 sets	$1.85
9 in.	per 25 sets	2.10
10 in.	per 25 sets	2.35
12 in.	per 25 sets	2.65

CEMENT FURNACE

5-lb. cans, net	$0.40
10-lb. cans, net	0.80
25-lb. cans, net	2.00
Per 100 lbs.	7.50

CLIPS

Damper

No-Rivet Steel, with tail pieces, per gross	$9.50
Rivet Steel, with tail pieces, per gross	7.50
Tail pieces, per gross	2.40

COPPER FOOTING

Copper Footing	43 %

CORNICE BRAKES

Chicago Steel Bending

Nos. 1 to 6B	Net

CUT-OFFS

Gal. plain, round or cor. rd.	
26 gauge	30 %
28 gauge	35 %

DAMPERS

Yankee Warm Air

7 inch,	doz.	$1.60
8 inch,	doz.	2.20
9 inch,	doz.	2.60
10 inch,	doz.	2.80
12 inch,	doz.	3.50
14 inch,	doz.	5.00

EAVES TROUGH

Galv. Crimpedge, crated	75-15 %
Zinc	60 %

ELBOWS

Conductor Pipe

Galv. plain or corrugated, round flat Crimp.	
28 gauge	60-10 %
26 gauge	50 %
24 gauge	15 %

Galv. Terne Steel

Plain Rd. and Rd. Corr.	
28 gauge	60-10 %
26 gauge	50 %
24 gauge	15 %

Square Corrugated

28 gauge	55 %
26 gauge	40 %

Portico Elbows

Standard Gauge Conductor Pipe, plain or corrugated.	
Not nested	70 & 5 %
Nested solid	70 & 5 %

Sq. Corr., A. & B. & Octagon

28 gauge	55 %
26 gauge	40 %

Portico

1, 1¼, 1½ inch	45 %

Copper

16 oz. all designs	50 %

Zinc

All styles	60 %

ELBOWS—Stove Pipe

1-piece Corrugated, Uniform Blue No. 28 Gauge,	Doz.
5 inch	$1.15
6 inch	1.25
7 inch	1.75

Adjustable—Uniform Blue

No. 28 Gauge, Uniform Blue.	
5 inch	$1.60
6 inch	1.75
7 inch	2.10

WOOD FACES—60 % off list.

FIRE POTS

	Each
No. 02 Gasoline Torch, 1 qt.	$ 5.13
No. 9250, Kerosene, or Gasoline Torch, 1 qt.	6.50
No. 10 Tinner's Furnace Square tank, 1 gal.	11.20
No. 15 Tinner's Furnace Round tank, 1 gal.	10.70
No. 21 Gas Soldering Furnace	8.00
No. 110 Automatic Gas Soldering Furnace	10.50

GLASS

Single and Double Strength, A, all brakets	85 %
Single and Double Strength, B, all brackets	87 %

HANGERS

Conductor Pipe

Milcor Perfection Wire	25 %
Milcor Triplex Wire	10 %

Eaves Trough

Steel (galv. after forming) from list	45 %
Selflock E. T. Wire, List	10 %

HOOKS

Conductor

"Direct Drive" Wrought Iron for wood or brick	15 %

MITRES

Galvanized Steel Mitres

28 gauge	70-15 %
26 gauge	70-5 %

PASTE

Asbestos Dry Paste

200-lb. barrel	$14.00
100-lb. barrel	7.50
50-lb. pail	4.25
25-lb. pail	2.15
10-lb. bag	1.00
5-lb. bag	0.50

PIPE

Galvanized

Crated and nested (all gauges)	75-12 ½ %
Crated and not nested (all gauges)	75-7 ½ %

Furnace Pipe

Double Wall Pipe and Fittings	60 %
Single Wall Pipe, Round Galvanized Pipe	60 %
Galvanized and Tin Fittings	60 %

Lead

Per 100 lbs.	$12.50

Stove Pipe

"Milcor" "Titelock" Uniform Blue Stove

28 gauge, 5 inch U. C. nested	$10.00
28 gauge, 6 inch U. C. nested	11.00
28 gauge, 7 inch U. C. nested	13.00
30 gauge, 5 inch U. C. nested	9.25
30 gauge, 6 inch U. C. nested	10.00
30 gauge, 7 inch U. C. nested	12.00

T-Joint Made Up

6 inch, 28 ga.	per doz.	$3.40

REGISTERS AND FACES

Floor Registers

Steel and Semi-Steel	40 & 10 %
All Cast Iron	20 %

Baseboard

2-Piece	40 & 10 %
1-Piece	40-10 & 20 %

Adjustable Ventilators

Adjustable Ventilators	40 & 10 %

COLD AIR FACES

Steel and Cast, less than 14" width	40 & 10 %
Steel, 14" and wider	65 & 10 %
Cast, 14" and wider	60 & 10 %
Special Cold Air Faces, Steel or Cast	40 & 10 %

RIDGE ROLL

Galv. Plain Ridge Roll, b'dld	75-15-5 %
Galv., Plain Ridge Roll, crated	75-15 %

SCREWS

Sheet Metal

7, ½ x ⅛, per gross	$0.52
No. 10, ⅜ x 3/16, per gross	0.68
No. 14, ⅛ x ¼, per gross	0.83

SHEARS, TINNERS' AND MACHINISTS'

Viking	$22.00

Lennox Throatless

No. 18	35 %
Shear blades	10 %
(f. o. b. Marshalltown, Iowa.)	

SHOES

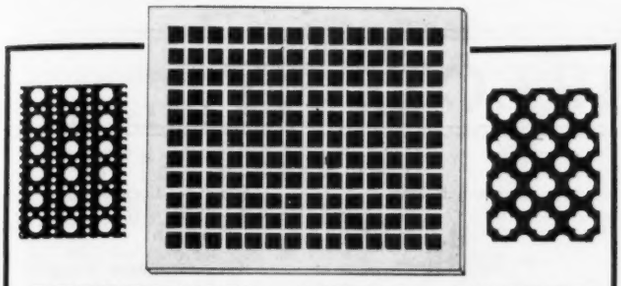
Galv. 28 Gauge, Plain or Corrugated, round flat crimp	60-10 %
26 gauge, round flat crimp	50 %
24 gauge, round flat crimp	15 %

SNIPS

Tinners'	Net

VENTILATORS

Standard	30 to 40 %
Milcor	Net



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Made to your specifications—in Steel, Brass, Bronze, etc.
All shapes—sizes and gauges—with screw holes if desired.
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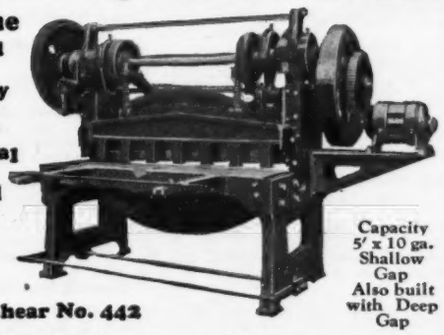

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1 BRILLION VACUUM PORTABLE CLEANER, complete with motor and all attachments.

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☐ Enclosed find $85—balance will be paid in four monthly instalments of $25 each, beginning one month from date.

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Individual Signing.....
Address.....
City.....
State.....

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☐ Include Advertising Matter with Shipment

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Brillion, Wis.

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American Fdy. & Furnace Co., Bloomington, Ill.
Independent Air Filter Co., Chicago, Ill.
Kleenaire Filter Co., Stevens Point, Wis.
Meyer & Bro. Co., F., Peoria, Ill.
Watt Mfg. Co., Sterling, Ill.

Air Washers
A. Gehri & Co., Tacoma, Wash.
Watt Mfg. Co., Sterling, Ill.

Aluminum Sheets
J. M. & L. A. Osborn Co., Cleveland, Ohio

Asbestos—Liquid
Technical Products Co., Pittsburgh, Pa.

Asbestos Paper
Standard Asbestos Co. of Chicago, Chicago, Ill.
Wilson, Grant, Inc., Chicago, Ill.

Blast Gates
Berger Bros. Co., Philadelphia, Pa.

Blowers—Furnace
American Fdy. & Furnace Co., Bloomington, Ill.
American Machine Products Co., Marshalltown, Iowa
Brundage Co., Kalamazoo, Mich.
A. Gehri & Co., Tacoma, Wash.
Lakeside Co., Hermansville, Mich.
Watt Mfg. Co., Sterling, Ill.

Bolts—Stove
Lamson & Sessions Co., Cleveland, Ohio
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Brakes—Bending
Dreis & Krump Mfg. Co., Chicago, Ill.
Interstate Machinery Co., Chicago, Ill.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Clev.

Brakes—Cornice
Dreis & Krump Mfg. Co., Chicago, Ill.

Brass and Copper
American Brass Co., Waterbury, Conn.

Cans—Garbage
Diener Mfg. Co., G. W., Chicago, Ill.
Osborn Co., The J. M. & L. A., Cleveland, Ohio

Castings—Malleable
Fanner Mfg. Co., Cleveland, Ohio

Ceilings—Metal
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Chaplets
Fanner Mfg. Co., Cleveland, Ohio

Cleaners—Vacuum
Brillion Furnace Co., Brillion, Wis.
National Super Service Co., Toledo, Ohio
Osborn Co., The J. M. & L. A., Cleveland, Ohio

Copper
American Brass Co., Waterbury, Conn.
Rockford Sheet Steel Co., Rockford, Ill.

Cornices
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Covering—Asbestos
Standard Asbestos Co. of Chicago, Chicago, Ill.
Wilson, Grant, Inc., Chicago, Ill.

Cut-offs—Rain Water
Milcor Steel Co., Mil., Canton., Chgo., La Crosse, K. C.

Dampers—Quadrants—Accessories
Aeolus Dickinson Chicago, Ill.
Hart & Cooley Co., Holland, Mich.
Howes Co., S. M., Boston, Mass.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Parker-Kalon Corp., New York, N. Y.

Dampproofings
Lastik Products Corp., Pittsburgh, Pa.

Damper Regulators
Sheer Co., H. M., Quincy, Ill.

Diffuser—Aid Duct
Aeolus Dickinson Chicago, Ill.

Drills—Electric
J. M. & L. A. Osborn Co., Cleveland, Ohio
The Stanley Electric Tool Co., New Britain, Conn.

Drive Screws—Hardened Metallic
Parker-Kalon Corp., New York

Eaves Trough
Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Chicago Metal Mfg. Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Rockford Sheet Steel Co., Rockford, Ill.

Elbows and Shoes—Conductor
Barnes Metal Products Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Rockford Sheet Steel Co., Rockford, Ill.

Filters—Furnace
Independent Air Filter Co., Chicago, Ill.
Kleenaire Filter Co., Stevens Point, Wis.

Fittings—Conductor
Barnes Metal Products Co., Chicago, Ill.
Braden Mfg. Co. Terre Haute, Ind.
Chicago Metal Mfg. Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Flanges
Chicago Metal Mfg. Co., Chicago, Ill.

Fluxes—Soldering
Kester Solder Co., Chicago, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Furnace Cement
Connors Paint Mfg. Co., Wm., Troy, N. Y.
Lastik Products Corp., Pittsburgh, Pa.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Technical Products Co., Pittsburgh, Pa.

Furnace Chain
Hart & Cooley Co., Holland, Mich.

Furnace Cleaners—Suction
Brillion Furnace Co., Brillion, Wis.
National Super Service Co., Toledo, Ohio

Furnace Fans
A-C Mfg. Co., Pontiac, Ill.
American Fdy. & Furnace Co. Bloomington, Ill.
Brundage Co., The, Kalamazoo, Mich.
Lakeside Co., Hermansville, Mich.
Robinson Co., A. H., Massillon, Ohio
Watt Mfg. Co., Sterling, Ill.

Furnace Filters
Independent Air Filter Co., Chicago, Ill.
Kleenaire Filter Co., Stevens Point, Wis.

Furnace Pokers
Fanner Mfg. Co. Cleveland, Ohio

Furnace Pulleys
Hart & Cooley Co., Holland, Mich.

Furnace Regulators
Noll Regulator Co., Youngstown, Ohio
Sheer Co., H. M., Quincy, Ill.
White Mfg. Co., Minneapolis, Minn.

Furnace Rings
Forest City Foundries Co., Cleveland, Ohio

Furnaces—Gas
Calkins & Pearce, Columbus, Ohio
Fox Furnace Co., Elyria, Ohio
Henry Furnace and Foundry Co., Cleveland, Ohio
Lennox Furnace Co., Marshalltown, Iowa
Robinson Co., A. H., Massillon, Ohio
Wise Furnace Co., Akron, Ohio
Western Steel Products Co., Duluth, Minn.

Furnaces—Oil Burning
Motor Wheel Corp., Heater Div., Lansing, Mich.

Furnaces—Warm Air
Agricola Furnace Co., Gadsden, Ala.
American Fdy. & Furnace Co., Bloomington, Ill.
American Furnace Co., St. Louis, Mo.
The Beckwith Co., Dowagiac, Mich.
Brillion Furnace Co., Brillion, Wis.
Deshler Foundry & Machine Works, Deshler, Ohio
Enterprise Boiler & Tank Works, Chicago, Ill.
Forest City Foundries Co. Cleveland, Ohio
Fox Furnace Co., Elyria, Ohio
Graff Furnace Co., Scranton, Pa.
Hall-Neal Furnace Co., Indianapolis, Ind.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Lennox Furnace Co., Marshalltown, Iowa Syracuse, N. Y.
May Fiebeger Furnace Co., Newark, Ohio
Meyer Furnace Co., The, Peoria, Ill.
Midland Furnace Co., Columbus, Ohio
Motor Wheel Corp., Heater Div., Lansing, Mich.
Mt. Vernon Furnace & Mfg. Co., Mt. Vernon, Ill.
Peerless Foundry Co., Indianapolis, Ind.
Premier Warm Air Heater Co., Dowagiac, Mich.
Richardson & Boynton, New York
Rybolt Heater Co., Ashland, Ohio
Schwab Furnace & Mfg. Co., Milwaukee, Wis.
Standard Fdy. & Furnace Co., De Kalb, Ill.
Waterman-Waterbury Co., Minneapolis, Minn.
Western Steel Products Co., Duluth, Minn.
Wise Furnace Co., Akron, Ohio

Gas Burning Attachments
Calkins & Pearce, Columbus, Ohio

Grilles
Auer Register Co., Cleveland, Ohio
Harrington & King Perforating Co., Chicago, Ill.
Hart & Cooley Co., New Britain, Conn.
Independent Register & Mfg. Co., Cleveland
Tuttle & Bailey Mfg. Co., New York
U. S. Register Co., Battle Creek, Mich.

Guards—Machine and Belt
Harrington & King Perforating Co., Chicago, Ill.

Handles—Boiler
Berger Bros. Co., Philadelphia, Pa.

Handles—Soldering Iron
Hyro Mfg. Co., New York, N. Y.

Handles—Furnace Door
Fanner Mfg. Co., Cleveland, Ohio

Hangers—Eaves Trough
Berger Bros. Co., Philadelphia, Pa.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Heat Regulation Systems
Noll Regulator Co., Youngstown, Ohio
Sheer Co., H. M. Quincy, Ill.
White Mfg. Co. Minneapolis, Minn.

Heaters—Cabinet
Fox Furnace Co., Elyria, Ohio
Mt. Vernon Furnace & Mfg. Co., Mt. Vernon, Ill.
Motor Wheel Corp., Heater Division, Lansing, Mich.
Waterman-Waterbury Co., Minneapolis, Minn.

Heaters—School Room
Meyer Furnace Co., The, Peoria, Ill.
Western Steel Products Co., Duluth, Minn.
Waterman-Waterbury Co., Minneapolis, Minn.

Humidifiers
Automatic Humidifier Co., Cedar Falls, Iowa
Diener Mfg. Co., G. W., Chicago, Ill.
Meyer & Bro. Co., F., Peoria, Ill.
Sallada Mfg. Co., Minneapolis, Minn.

Lath—Expanded Metal
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Machines—Crimping
Bertsch & Co., Cambridge City, Ind.
Yoder Co., The, Cleveland, O

Machinery—Culvert
Bertsch & Co., Cambridge City, Ind.
Interstate Machinery Co., Chicago, Ill.

Machinery—Rebuilt
Interstate Machinery Co., Chicago

Machines—Tinsmith's
Bertsch & Co., Cambridge City, Ind.
Dreis & Krump Mfg. Co., Chicago, Ill.
Hyro Mfg. Co., New York, N. Y.
Interstate Machinery Co., Chicago, Ill.
Marshalltown Mfg. Co., Marshalltown, Iowa
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Clev.
The Stanley Electrical Tool Co., New Britain, Conn.
Viking Shear Co., Erie, Pa.
Whitney Mfg. Co., W. A., Rockford, Ill.
Yoder Co., The, Cleveland, O.

Metals—Perforated
Chicago Perforating Co., Chicago
Harrington & King Perforating Co., Chicago, Ill.

Miters—Eaves Trough
Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Braden Mfg. Co., Terre Haute, Ind.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

(Continued on page 54)

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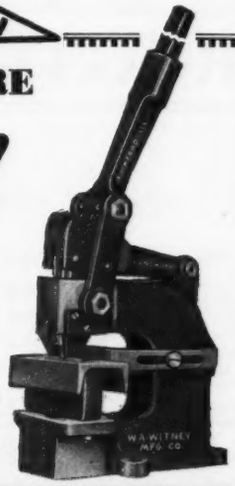
WHITNEY PUNCHES!

The Standard for over 20 years. The name "Whitney" on a punch insures satisfaction and quality.

There's a Whitney Punch for You

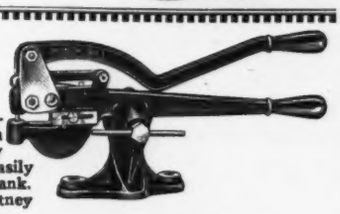


No. 91 BENCH

A new Whitney punch of unusual strength and many uses. Capacity 5/8" holes through 1/4" — 1" hole through 3/16"—2" hole through 1/8". Punches from 1/8 to 2" holes. The Punch you've been waiting for.

No. 8

With Light Vise



A medium capacity close-corner Whitney punch mounted on the Whitney special light vise. Vise easily bolted to bench or plank. Portable. Will fit any Whitney lever punch.

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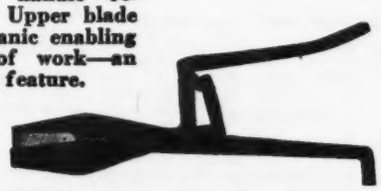
Compound lever handle—removable blades. Upper blade away from mechanic enabling easy following of work—an exclusive Viking feature.



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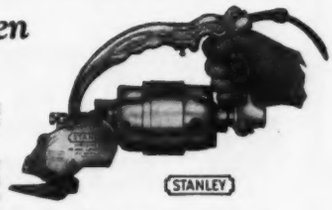

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It has a capacity of No. 18 U. S. Gauge (.050") hot rolled steel or galvanized iron.

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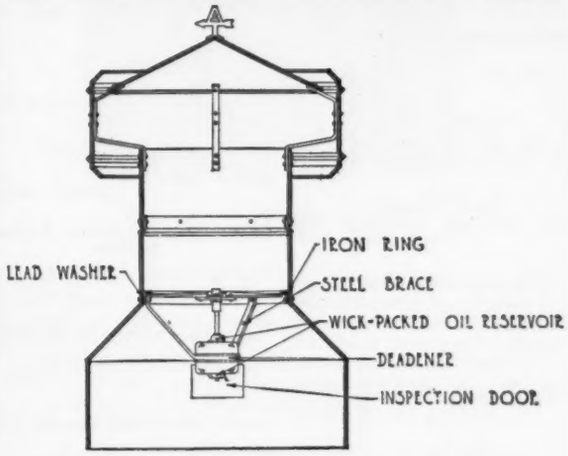

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Eliminating wind and weather hazard.

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BUYERS' DIRECTORY

(Continued from page 52)

Nails—Hardened Masonry
Parker-Kalon Corp., New York, N. Y.

Oil Burners
Berryman System of Oil Heating, Inc., Chicago, Ill.
Bettendorf Mfg. Co., Bettendorf, Iowa
Bock Oil Burner Co., Madison, Wis.
McIlvaine Burner Corp., Evanston, Ill.
Silent Automatic Corp., Detroit, Mich.

Paint
Connors Paint Mfg. Co., Wm., Troy, N. Y.

Perforated Metals
Harrington & King Perforating Co., Chicago, Ill.

Pipe and Fittings—Furnace
Henry Furnace & Fdy. Co., Cleveland, Ohio
Meyer & Bro. Co., F., Peoria, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Peerless Foundry Co., Indianapolis, Ind.

Pipe and Fittings—Stove
Meyer & Bro. Co., F., Peoria, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Pipe—Conductor
Barnes Metal Products Co., Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Pipe—Spiral
Chicago Metal Mfg. Co., Chicago, Ill.

Punches
Bertsch & Co., Cambridge City, Ind.
Hyro Mfg. Co., New York
Interstate Machinery Co., Chicago, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.
W. A. Whitney Mfg. Co., Rockford, Ill.

Punches—Combination Bench and Hand
Hyro Mfg. Co., New York, N. Y.

Punches—Hand
Hyro Mfg. Co., New York, N. Y.
W. A. Whitney Mfg. Co., Rockford, Ill.

Putty—Stove
Connors Paint Mfg. Co., Wm., Troy, N. Y.

Radiator Cabinets
Hart & Cooley Co., Holland, Mich.
Tuttle & Bailey Mfg. Co., New York

Ranges—Gas
The Beckwith Co., Dowagiac, Mich.
Mt. Vernon Furnace & Mfg. Co., Mt. Vernon, Ill.

Registers—Warm Air
Auer Register Co., Cleveland, Ohio
Forest City Foundries Co., Cleveland, Ohio
Hart & Cooley Co., Holland, Mich.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Independent Register & Mfg. Co., Cleveland, Ohio
Meyer & Bro. Co., F. Peoria, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Rock Island Register Co., Rock Island, Ill.
Symonds Register Co., St. Louis, Mo.
Tuttle & Bailey Mfg. Co., Chicago, Ill.
United States Register Co., Battle Creek, Mich.

Register Shields
General Products Corp., Indianapolis, Ind.

Registers—Wood
American Wood Register Co., Plymouth, Ind.
Auer Register Co., Cleveland, Ohio
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Regulators—Heat
Modern Heat Regulator Co., Cleveland, Ohio
H. M. Sheer Co., Quincy, Ill.
Time-O-Stat Controls, Div. Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
White Mfg. Co., Minneapolis, Minn.

Ridging
American Rolling Mill Co., Middletown, Ohio
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Rolls—Forming
Bertsch & Co., Cambridge City, Ind.
Interstate Machinery Co., Chicago, Ill.

Roofing Cement
Connors Paint Mfg. Co., Wm., Troy, N. Y.
Lastik Products Corp., Pittsburgh, Pa.

Roof Paints
Lastik Products Corp., Pittsburgh, Pa.

Roof—Flashing
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Roofing—Iron and Steel
Inland Steel Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Republic Steel Corp., Youngstown, Ohio
Ryerson & Sons, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Roofing—Tin
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Rubbish Burners
Hart & Cooley Co., Holland, Michigan

School—Sheet Metal Pattern Drafting
St. Louis Technical Institute, St. Louis, Mo.

Schools—Warm Air Heating
St. Louis Technical Institute, St. Louis, Mo.

Screws—Hardened Metallic Drive
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Parker-Kalon Corp., 200 Varick St., New York

Screws—Hardened Self-Tapping, Sheet Metal
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Parker-Kalon Corp., New York

Screens—Perforated Metal
Harrington & King Perforating Co., Chicago, Ill.

Scuppers
Aeolus Dickinson, Chicago, Ill.

Shears—Hand and Power
Interstate Machinery Co., Chicago, Ill.
Marshalltown Mfg. Co., Marshalltown, Iowa
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.
The Stanley Electric Tool Co., New Britain, Conn.
Viking Shear Co., Erie, Pa.
Yoder Co., The Cleveland, O.

Sheet Metal Screws—Hardened, Self-Tapping
Parker-Kalon Corp., New York

Sheets—Alloy
International Nickel Co., New York, N. Y.
Republic Steel Corp., Youngstown, Ohio
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Sheets—Black and Galvanized
Inland Steel Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Republic Steel Corp., Youngstown, Ohio
Rockford Sheet Steel Co., Rockford, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.
Taylor Co., N. & G., Philadelphia, Pa.

Sheets—Iron
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Republic Steel Corp., Youngstown, Ohio
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Shingles and Tiles—Metal
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Sifters—Ash
Diener Mfg. Co., G. W., Chicago, Ill.

Sky Lights
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Snips
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Solder—Acid Core
Kester Solder Co., Chicago, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Solder—Self-Fluxing
Kester Solder Co., Chicago, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Solder—Rosin Core
Kester Solder Co., Chicago, Ill.

Solder
Kester Solder Co., Chicago, Ill.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Soldering Furnaces
Diener Mfg. Co., G. W., Chicago, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Specialties—Hardware
Diener Mfg. Co., G. W., Chicago, Ill.

Stars—Hard Iron Cleaning
Fanner Mfg. Co., Cleveland, Ohio

Tinplate
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.
Osborn Co., The J. M. & L. A., Cleveland, Ohio

Tools—Tinsmith's
Bertsch & Co., Cambridge City, Ind.
Dreis & Krump Mfg. Co., Chicago, Ill.
Hyro Mfg. Co., New York, N. Y.
Interstate Machinery Co., Chicago, Ill.
Marshalltown Mfg. Co., Marshalltown, Iowa
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Peck, Stow & Wilcox Co., Southington, Conn.
Rockford Sheet Steel Co., Rockford, Ill.
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.
The Stanley Electric Tool Co., New Britain, Conn.
Viking Shear Co., Erie, Pa.
Whitney Mfg. Co., W. A., Rockford, Ill.

Torches
Diener Mfg. Co., G. W., Chicago, Ill.
Osborn Co., The J. M. & L. A., Cleveland, Ohio
Ryerson & Son, Inc., Jos. T., Chgo., N. Y., St. L., Det., Cleve.

Trimmings—Stove and Furnace
Fanner Mfg. Co., Cleveland, Ohio

Vacuum Cleaner—Furnace
Brillion Furnace Co., Brillion, Wis.
National Super Service Co., Toledo, Ohio

Ventilators—Floor
Aeolus Dickinson, Chicago, Ill.

Ventilators—Roof
Aeolus Dickinson, Chicago, Ill.
Berger Bros. Co., Philadelphia, Pa.
Paul R. Jordan & Co., Indianapolis, Ind.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.

Ventilators—Ceiling
Hart & Cooley Co., New Britain, Conn.
Henry Furnace & Fdy. Co., Cleveland, Ohio
Independent Reg. & Mfg. Co., Cleveland, Ohio

Wood Faces—Warm Air
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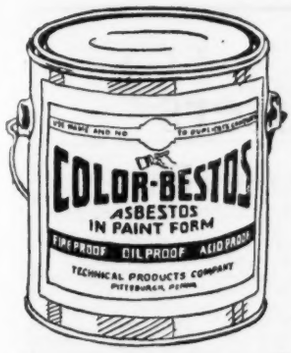
American Wood Register Co., Plymouth, Ind.
Milcor Steel Co., Mil., Canton, Chgo., La Crosse, K. C.



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1944 North 13th Street Toledo, Ohio

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The dealer who has never sold Torrid Zone steel furnaces has no conception of the many advantages this furnace line offers. To say you are familiar with Torrid Zone construction is not enough. There are, free engineering service, newspaper and dealer help advertising, financial aid, an unusual variety of furnace sizes, quick deliveries made possible by large warehouse stocks, and a score of other Torrid Zone service features of vital interest to every furnace dealer. Why not investigate for yourself Torrid Zone possibilities. Write for complete information on the Torrid Zone line.

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Classified Advertising

BUSINESS CHANCES

Lightning Rods—Dealers who are selling Lightning Protection will make money by writing to us for our latest Factory to Dealer Prices. We employ no salesmen and save you all overhead charges. Our Pure Copper Cable and Fixtures are endorsed by the National Board of Fire Underwriters and hundreds of dealers. Write today for samples and prices. L. K. Diddie Company, Marshfield, Wis.

For Sale—Retail Furnace and Sheet Metal Business. Established eighteen years. Have approximately 800 furnaces installed by us in this County needing service and repairs. Will sell for invoice price of tools and fixtures of about $1,000. No stock to sell. Address Huron Furnace Company, Huron, South Dakota. C-535

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Here's a Bargain!

Complete punches and forming dies for building 24" and 28" sheet steel body furnaces must be sold quick to make space for added factory equipment. Necessary wood patterns for castings and several thousand curved fire brick lining are to be sold in this lot. Punches and dies are not worn; have been used in producing not over 100 furnaces.

This entire lot of equipment and material is for sale at a ridiculously low price. It simply must be moved quickly.

The Marion Steel Body Co.
MARION, OHIO

BUSINESS CHANCES

FOR SALE

Oil burner business. Over 1500 units now in use. Everything complete—patents, patterns, goodwill, machinery. Very little cash needed.

Address H-535
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139 N. Clark St. Chicago, Ill.

For Sale—Good clean stock of hardware, and tin shop and warehouse room. Stock invoices $15,000. Sickness reason for selling. Address K-534, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

For Sale—Sheet Metal and Warm Air Heating business in a southern Illinois town of 30,000. Established ten years. Average yearly business, $15,000 to $20,000. Wish to sell building, stock and equipment. War service disability forcing retirement. Large display room and office space, located in heart of city. Address L-534, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

For Sale—Sheet Metal works, well equipped and twenty years on the same place. Reasonable rent, good business for right party. Selling on account of ill health. Address R-534, AMERICAN ARTISAN, 139 North Clark St., Chicago, Illinois.

For Sale—Established tin and plumbing business, including all necessary tools and material. Located in country town of 1200 population. Good reason for selling. For further particulars write M-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Ill.

For Sale—Sheet metal and furnace business. A going business. Reason for selling, retiring. Near St. Louis, Missouri. Price, $800, complete. Address R-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

For Sale—Take advantage of this opportunity to buy a well equipped sheet metal shop and running business located in one of Chicago's best suburbs. For particulars write X-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

HELP WANTED

For experienced furnace salesmen or manufacturers' agents that are acquainted with furnace and sheet metal trade, we have several open territories at the present time on straight commission basis. In replying please give past experience and present connections. Address Agricola Furnace Company, Gadsden, Alabama. Z-535

Wanted—A combination man who can do plumbing and sheet metal work, and who is willing to go out and estimate work. A real opportunity for party who wants to advance. Address Independent Supply Co., Inc., West Frankfort, Illinois. G-534

Wanted—Shop foreman that can do metal work, furnace work, roofing and everything that comes in a general shop. No plumbing. Steady work. Address Pekin Hdwe. Co., Pekin, Ill. H-534

Wanted—An all-round man. One that can do tinning and furnace work, who can do selling, also help in hardware store in town of 600 population in southern Wisconsin. Address B-536, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

HELP WANTED

Experienced Stove and Furnace salesmen for all states. Have very attractive straight commission proposition. Address The Peninsular Stove Company, Detroit, Michigan. F-534

Manufacturers' Agents

Wanted to sell our furnace cement, roofing paint and cement and calking compounds. Our consistent trade paper advertising is creating demand. Exclusive territory given with liberal commission. Address X-533, AMERICAN ARTISAN, 139 N. Clark Street, Chicago, Illinois.

Furnace—Boiler—Plumber combination man with Wisconsin license. A real business man, sober and industrious. One who can invest $2000 or more in a large successful company. Write full details in first letter. Address John Steffel, Manager, 2101 Eastwood Place, Milwaukee, Wisconsin. A-534

SALESMEN

who are permitted to carry side line, calling on furnace dealers, to sell furnace fans on commission. Address W-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

SITUATION WANTED

SITUATION WANTED

Heating estimator, experienced fully in all branches. Can sell, superintend or handle department. Address T-534, American Artisan, 139 N. Clark Street, Chicago, Illinois.

Situation Wanted—I am an all around sheet metal worker, and would like to hear from somebody who is going to need a working foreman or a bench man about April 1st. Address Mechanic, 417 Jones Street, Clearwater, Florida. Y-533

Situation Wanted—Experienced hardware clerk wishes steady position. Do plumbing, furnace repairing. Married. Don't drink or smoke. Good reference. Wish to locate in Middle-West. Address Ray Boyle, Payette, Idaho. W-534

Wanted—To correspond with an owner of sheet metal and heating shop, who is looking for a first class mechanic as a working partner or on percentage. Address E-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—Would like to talk with a manufacturer of coal and gas fired furnaces who believes that there is a great future for gas as a fuel. For twelve years I served a former well known manufacturer as salesman, in sales promotion, and as branch sales manager. Believe I can be of value in your executive sales department. Write in complete confidence to P-534, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Situation Wanted by sheet metal worker with eighteen years experience in general sheet metal work, heating, and ventilating. Can estimate, lay out, and handle men. Am thirty-nine years old, married, sober, and steady. Prefer Union shop in Illinois with privilege to buy at some time. Address X-534, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

SITUATION WANTED

HEATING ENGINEER
desires connection with manufacturer. Age, 35. Seventeen years experience in all branches warm air heating exclusively—retail, wholesale, manufacturing. Member A.S.H.V.E. nine years. Satisfactory references. Address P-535, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Situation Wanted—By competent, sober sheet metal worker, plumber and furnace man, good on trunk line and duct work, also fan installations and air conditioning. Can handle anything in the above lines in up-to-date workmanlike manner. Address F-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Situation Wanted—By A-1 sheet metal worker and warm air heating man. 31 years old, steady and sober. Thoroughly experienced in blow-piping, ventilating and general sheet metal work. Can read blueprints, draw patterns and estimate if necessary. Can also do good job of plumbing. Good references. Will go anywhere. Address D-534, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Situation Wanted—I am a practical sheet metal worker. Will go anywhere but would prefer a good shop to run on a percentage. Address L. J. Egan, 306 South Main Street, El Dorado, Kansas. Y-534

Wanted—Position as manager of warm air heating department with well rated firm. Nearly 15 years experience in residence, church and industrial heating. Advertising and sales promotion ability of high order. Know how to build a profitable repair department. Address O-534, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Situation Wanted—By a first class sheet metal worker and furnace man. Good reliable man, steady and sober. Middle aged and married. Would consider running shop on percentage basis. Address J-534, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Wanted to hear from any furnace or sheet metal manufacturers or jobbers who want a good salesman for northern Minnesota, Dakota and eastern Montana. Have had the experience and can deliver the goods. Know this country from 35 years experience. Write me before closing territory. Address C-534, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Ill.

Situation Wanted—By sheet metal worker and furnace man with 18 years experience in all lines. Can lay slate, cut patterns, lay out furnace job standard code and forced air. Have had factory maintenance experience. Will go anywhere. Married, sober, reliable in every way. Please state wages. Address Z-533, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Illinois.

Situation Wanted—By a heating and ventilating man, capable of handling any difficult job. Willing to put mechanical skill against the best employed as to the wages received. State full particulars in first letter. Address Bert J. Hawkins, 903 Glenwood, Station 2, Owosso, Michigan. S-535

Situation Wanted—A strictly first class sheet metal mechanic, layout man and foreman is looking for a steady job. 32 years' experience on all kinds of work. Married, sober, steady, neat and accurate. A-1 references. Small city or town preferred. Please state particulars. Address Hiram, 1725 South Franklin Street, Muncie, Indiana. T-535

Situation Wanted—By a first class all-round tinning, plumbing and furnace man. Experienced in roofing work also. Steady position wanted. Will go anywhere. Address Arthur Klatt, 3749 Greenview Avenue, Chicago, Illinois. Y-535

Situation Wanted—By tinner and plumber; 20 years' experience. Would also invest in partnership. Address Wm. Meyer, Box 443, Monticello, Iowa. A-536

TOOLS AND MACHINES

Wanted—36" squaring shears 16 gauge, 48" slip roll 14 gauge, 4 or 8' box pan brake 16 gauge, No. 12 Marshalltown Throatless shear. All tools must be priced cheap for cash. Write Portable Tank & Pump Company, Clarkson, Nebraska. A-535

Wanted—Set of used Tinners' tools and machines. Must be in A-1 condition. Address D-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

For Sale—Complete set of Tinners tools and machines (except brake), $175.00. Address G-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

For Sale—One 8-foot power squaring shear, 18 gauge capacity. One Power Ridge Roll machine in A-1 condition. Will be sold cheap if taken at once. Address B-534, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

For Sale—One 30-inch square shears, $20; one stovepipe crimper, $5; one stovepipe folding machine, $10; one 20-inch pipe folding machine, $20; one grooving machine, $15; one setting down machine, $10; one turning and wiring machine, $10. First check for $75 takes the lot, or will sell each separate. Address Noble Sheet Metal Works, 119 South Stevens Street, Rhinelander, Wisconsin. J-535

Wanted—One second hand 8-foot brake, must be reasonable. Would also consider complete set of used tools for small shop. Address Gilt Edge Heating Company, 2514 East Dayton Street, Madison, Wisconsin. L-535

MISCELLANEOUS

For Sale—Used correspondence course in sheet metal design and pattern drafting. Address Z-534, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Wanted—An old style Brillion furnace cleaner. Inquire 1234 Pennsylvania Avenue, North Side, Pittsburgh, Pennsylvania. B-535

For Sale—Complete equipment for manufacturing a modern line of double and single furnace pipe and fittings, elbows, etc. Also two valuable patents on a new design boiler plate oil burning warm air furnace. Low cost to manufacture; 60 per cent more efficient. Address K-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

Wanted—Equipment for making tanks up to ¼-inch capacity. Also equipment for making stock tanks, metal culverts, etc. Must be in good condition and reasonably priced. Address O-535, AMERICAN ARTISAN, 139 North Clark Street, Chicago, Illinois.

BOOKS

Exhaust and Blow Piping, by Hayes—Exhaust and Blow Piping has had an unusually big demand. A fresh supply is now off the press and is in our hands for immediate delivery. It has an invaluable treatise on the planning, cost, estimation and installation of fan piping in all its branches, giving all necessary guidance in fan work blower and separator construction. 159 pages, 5x8. 51 figures. Cloth. $2.00. Order from Book Department, AMERICAN ARTISAN, 139 N. Clark St., Chicago, Illinois.

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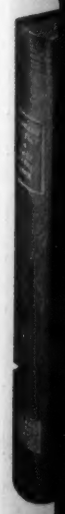

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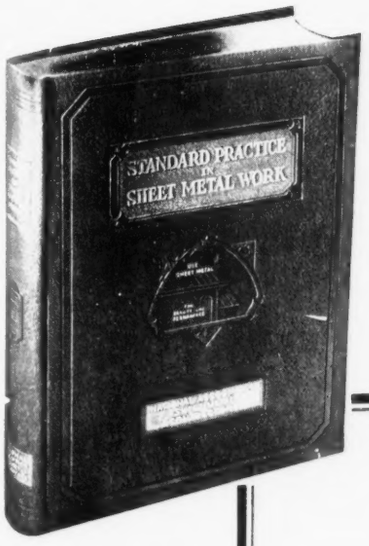

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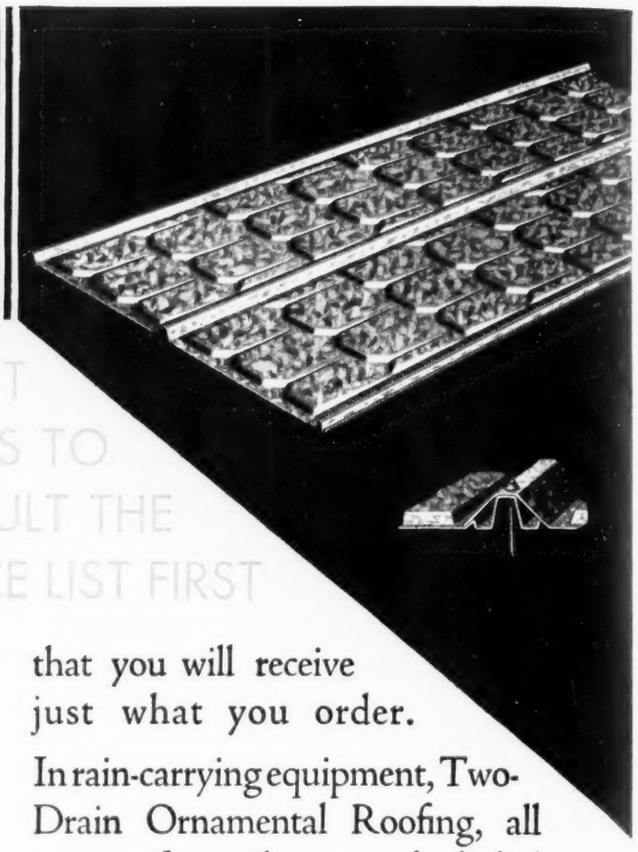

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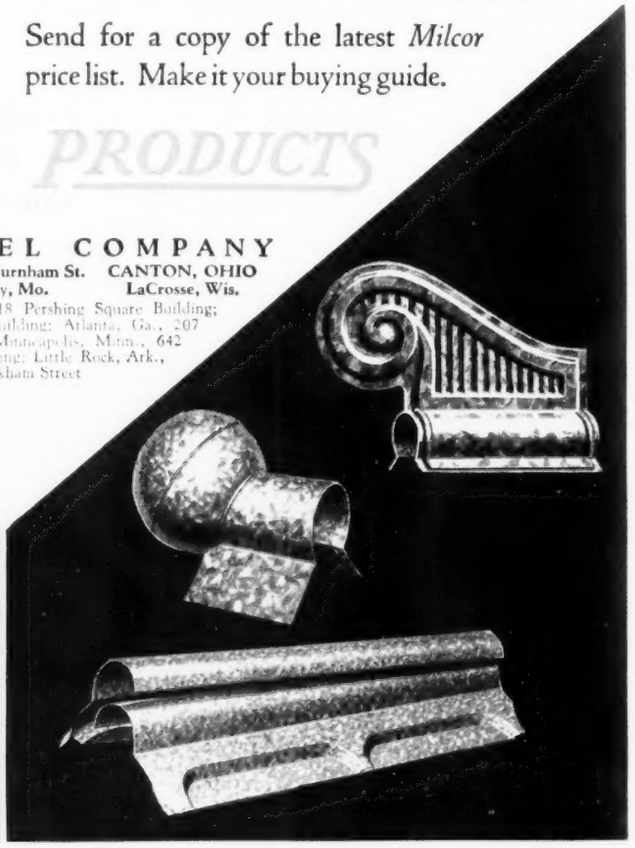

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